

Village chicken production systems in rural Africa

Household food security
and gender issues

FAO
ANIMAL
PRODUCTION
AND HEALTH
PAPER

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Food
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by

Alchi J. Kitalyi

André Mayer Research Fellow (1994-1995)

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Foreword

The poultry production systems of Africa are mainly based on the scavenging indigenous chickens found in virtually all villages and households in rural Africa. These systems are characterized by low output per bird. Nevertheless, over 70 percent of the poultry products and 20 percent of animal protein intake in most African countries come from this sector. Therefore, increased rural poultry production would result in a positive impact on household food security both in increased dietary intake and in income generation.

Increasing meat and egg production from rural poultry has been a major concern of FAO for many years. The Organization has supported various improvement programmes ranging from the introduction of productive exotic breeds under intensive management systems to improved backyard production, vaccine production and disease control. In the early 1990s, the FAO Animal Production and Health Division reviewed the achievements made in the control of poultry diseases, particularly of Newcastle disease. The assessment noted the progress that had been made in Southeast Asia with initiatives spearheaded by the Australian Centre for International Agricultural Research through the promotion of an oral vaccine based on a naturally attenuated Newcastle disease strain with the characteristics of heat resistance and an ability to spread horizontally within a flock. Similarly, improvements in Asia, such as the Bangladesh semi-scavenging model, have shown that increased rural poultry production can result in increased food production and a more equitable distribution of food and income – especially between men and women. There have been few similar activities for Africa, where problems of land tenure, food security and rural poverty have been more acute. It was agreed therefore that the André Mayer Research Fellowship award for the 1994-1995 biennium should examine the village chicken production systems of Africa, describe the biological and socio-economic factors that affect them, identify improved technologies and suggest appropriate development strategies.

The main findings of this study support the hypothesis that village chicken production forms the basis for transforming the rural poultry sector from subsistence to a more economically productive base. The potentials, major constraints and possible solutions for improved production have been identified. However, realization of sustainable improvements has often been limited by the inadequacy of the single-discipline approach to addressing the highly interrelated production constraints. Given the integrated nature of most farming systems, a holistic interdisciplinary approach to rural poultry production, including institutional and organizational capacity building, is imperative. This study also highlights the importance of information systems, which include data management and analysis, as a tool in planning, developing and assessing the impact of interventions to improve rural poultry production.

This study coincided with the World Food Summit, held at FAO, Rome, from 13 to 17 November 1996, where delegations committed their governments and civil society to a global attack on food insecurity and poverty. Poultry, like other short-cycle animal stock, is viewed by the FAO Special Programme for Food Security (SPFS) as a crucial element in the struggle for sustained food production and

This One



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poverty alleviation. The guidelines provided in this study are particularly pertinent to those countries participating in the SPFS where village chicken production will have a substantial impact on increased household food security and gender equity.

T. Fujita

Director

FAO Animal Production and Health Division

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Abbreviations

ACIAR

Australian Centre for International
Agricultural Research

AGRICOLA

Agriculture On-line Access

AGRIS

International Information System for the
Agricultural Sciences and Technology

AGRITEX

Agriculture Technical Extension Department,
Zimbabwe

ANRDP

African Network for Rural Poultry
Development

CAB

Commonwealth Agricultural Bureaux

DAD-IS

Domestic Animal Diversity Information System

DANIDA

Danish International Development Agency

EIU

Economist Intelligence Unit

FAO

Food and Agriculture Organization of the
United Nations

FARMESA

Farm-Level Applied Research Methods for
Southern and Eastern Africa

FSTA

Food Science Technology Abstracts

GDP

Gross domestic product

GIS

Geographic Information System

LIFDC

Low-income food-deficit country

ND

Newcastle disease

NGO

Non-governmental organization

NORAD

Norwegian Agency for International
Development

OIE

International Office of Epizootics

PANVAC

Pan African Veterinary Vaccine Centre

RADISCON

Regional Animal Disease Surveillance and
Control Network

SPFS

Special Programme for Food Security

TROPAG & RURAL

Abstracts on Tropical Agriculture and
Abstracts on Rural Development in the
Tropics

UN

United Nations

UNDP

United Nations Development Programme

WID

Women in development

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Introduction

BACKGROUND

Village chicken production systems are based on the scavenging indigenous domestic fowl (*Gallus domesticus*), the predominant species in the rural poultry sector in Africa. These local chickens remain predominant in African villages despite the introduction of exotic and crossbred types, because farmers have not been able to afford the high input requirement of introduced breeds (Kaiser, 1990; Safalaoh, 1997). Although the introduction of high-yielding chicken breeds in Africa dates back to the 1920s, village chicken populations comprise from five to 50 local types. In most African countries, the chickens have no regular health control programme, may or may not have shelter, and scavenge for most of their nutritional needs. Supporting data in the literature have been provided for Burkina Faso (Bourzat and Saunders, 1990), Ghana (van Veluw, 1987), Mali (Kuit, Traore and Wilson, 1986), the Niger (Abdou and Bell, 1992), Togo (Aklobess, 1990) and the United Republic of Tanzania (Yongolo, 1996).

Village chicken systems in rural Africa are characteristically:

- an indigenous and integral part of the farming system, with short life cycles and quick turnovers;
- low-input production systems with outputs accessible at both interhousehold and intrahousehold levels;
- a means of converting low-quality feed into high-quality protein.

Moreover, land – a critical production resource in rural Africa – is not a limiting factor in village chicken production systems. Consequently, disadvantaged groups in the community can be direct beneficiaries of village chicken improvement programmes. For example, chicken production improved the status of landless women in Bangladesh through access to more food, income and labour, as well as increased social status in the rural community (Saleque and Mustafa, 1996). The Bangladesh project was based on a semi-scavenging model for rural poultry that combined technical improvements with institutional and organizational support (Jensen, 1996).

It is important to address gender in rural development, because surveys in a number of African countries have

reported gender plurality in ownership, management and decision-making (Olayiwole, 1984; Achiemping, 1992; Alders, 1997; Scola, 1992; Ngongi, 1996). Access to village chickens for women encourages involvement of women in rural development, particularly where technology transfer includes the participation of end users.

In the mid-1980s, most countries suffered a slowdown in economy that affected the import-dependent production sectors such as commercial poultry. According to Sonaiya (1990a), the intensive and semi-intensive poultry production systems, which mushroomed in the 1970s, almost collapsed because of grain deficit. In Nigeria during the 1980s, there was a substantial increase in the quantity of rural poultry meat in the market as a result of the decreasing supply of commercial poultry (Suleiman, 1989). Therefore, several poultry scientists have recently suggested a specific scientific thrust for rural poultry, aimed at improving the understanding of the biological and socio-economic factors affecting the input-output relationships and the economic efficiency of the production systems.

A long-term programme on village chicken improvement, supported by the Australian Centre for International Agricultural Research (ACIAR) resulted in substantial improvements in the contribution of the chickens to household food production and welfare in Southeast Asia (Supramaniam, 1988; Oh, 1990; Johnston, 1990). The Southeast Asian programme was based on the control of Newcastle disease (ND) using a heat-stable oral vaccine. ND is rated as the most devastating disease of village chickens in both Africa (Sonaiya, 1990b) and Asia (Mohanty, 1987). However, the relative significance of ND in relation to other diseases of poultry and the various biological, physical and socio-economic factors in village chicken production systems are poorly understood (Pandey, 1993).

A pilot scheme to introduce the heat-stable orally administered ND vaccine, supported by FAO, was started in 1994 in Ethiopia and the Gambia through the Technical Cooperation Programme project RAF/TCP/2376, "Assistance to rural women in protecting their village chickens against Newcastle disease" (Rushton, 1996a). At the same time, a proposal for a broader study

on village chicken production systems in Africa was submitted to the Director-General of FAO by the Animal Production and Health Division (AGA) for funding under the André Mayer Research Fellowship. In promoting this proposal, AGA was concerned about the slow progress in rural poultry production in Africa, despite the Organization's support of various improvement programmes as well as awareness-raising activities through international workshops (Branckaert, 1992). The André Mayer prospectus for this fellowship envisaged a study on assistance to African rural women in village poultry production, with the following objectives:

- to review the available data on rural poultry production constraints in Africa;
- to quantify the relative significance of disease and production systems as primary constraints;
- to develop appropriate decision support and computer-based systems for evaluation of disease control and production system intervention programmes on the socio-economic welfare of rural women;
- to recommend the most cost-effective targets for FAO's technical assistance, which should be focused on poverty alleviation among rural women.

The period of the 1994-1995 biennium André Mayer Research fellowship coincided with the launching of the Special Programme for Food Security (SPFS) in September 1994 in response to the urgent need to address the problem of household food insecurity in low-income food-deficit countries (LIFDCs). The programme was endorsed by the World Food Summit, held in Rome from 13 to 17 November 1996, in the Rome Declaration and the World Food Summit Plan of Action. Household poultry forms one of the elements of the diversification component of the SPFS. These major developments during the course of conducting the research influenced the choice to emphasize household food security and gender issues in this study. The main message is that village chickens have an important role in increasing household food security and income, as well as increasing gender equity.

OBJECTIVES

The main objective of the study was to undertake an in-depth review of research and development work on village chicken production systems in Africa and to suggest improvement strategies for increased food production and social welfare.

The specific objectives were:

- to undertake an in-depth review of literature on rural poultry production;
- to review and study the potential of village chicken production systems in household food security and household economies;
- to study gender issues and involvement of women and children in village chicken production in Africa and suggest strategies for incorporation of gender issues in future improvement programmes;
- to study the input-output relationships in village chicken production using computer-based models;
- to identify the main performance indicators of the village chicken production system and develop guidelines for drawing cost-effective improvement programmes.

CONCEPTUAL FRAMEWORK

The main concept of the study is that village chickens form the basis for increasing food production and income in the rural communities of Africa. A new research and development thrust, which will combine technical improvements and socio-economic aspects, is required to achieve this endeavour.

In the classification of world livestock production systems, poultry systems are described under landless monogastric systems, where feed is introduced from outside the farm (FAO, 1996). Poultry production systems exclusively based on hybrid and high-production exotic breeds and high energy concentration feeds are described by Sere, Steinfeld and Groenewold (FAO, 1996). Although the intensive poultry production systems can be found in rural areas of Africa, the most dominant production systems are the extensive systems that are based on the local indigenous type and on scavenging feeding systems (Table 1). Intermediary or semi-intensive systems, also referred to as backyard poultry, have developed recently with higher input and output.

As already noted in the preceding section, the scavenging system dominates the rural poultry sector of most African countries, and the domestic fowl (*Gallus domesticus*) is the most common species. In the present study, the term village chicken is adopted from recent studies in rural poultry development, which differentiates the scavenging chickens from the intensive production systems. The term village chicken best describes the scavenging chickens because of the effect of the village socio-economic and biophysical environment on the production and health status of the chickens (Figure 1). The human settlement pattern, communal housing of

TABLE 1
Characteristics of poultry production

Characteristic	Intensive	Semi-intensive	Scavenging
Breed and flock size	Specialized breeds: 500-5 000	Specialized and dual-purpose breeds: 50-200	Local indigenous type: <50
Housing	Modern housing, generally with concrete walls and regulated internal environment	Varies from modern houses to simple housing made from locally available materials	Specific poultry houses are rare
Feed resource	Commercially compounded feeds	Commercially compounded, homemade mixtures and scavenging	Scavenging and occasional feeding with home grains and household refuse
Health programme	Standard and regular animal health programme	Disease control and health programme at varying levels	No regular health programme of disease control measures in place
Markets	Cold chain system for input-output distribution	Input and output distribution is based on existing trading centres	No formal marketing channels
Infrastructure	Water, electricity and communication available	Modest infrastructure depending on proximity to urban centres	Underdeveloped infrastructure
Product storage and processing	Products refrigerated, dressed birds and table eggs refrigerated	Minimum refrigeration, occasional dressing of birds	No refrigeration, sales of live birds and eggs
Technology/information	Formal training, extension services available – information disseminated through producer and consumer associations	Moderate formal training and extension services	Local knowledge, with moderate or no extension services

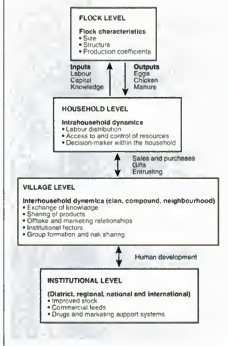
chickens, exchange of live chickens and chicken products affect production performance, breeding pattern and disease epidemiology.

The focus on gender is adopted in the study on the assumption that improving the village chicken production systems in rural Africa will result in increased opportunities and more equitable distribution of food and income within and among households in rural Africa. This school of thought is supported by the following facts about the production system:

- the management of village chickens can easily be combined with other activities because of the proximity of the chickens to homesteads (Bradley, 1992);
- chicken products are among the few agricultural products directly accessible to women in rural areas and increased food production from chickens will improve household food security;
- village chicken production is not strongly linked to land resource, which is one of the main production constraints among the disadvantaged members of the community.

Finally, for village chicken improvement programmes to have a positive impact on household economies and gender equity, women's concerns should be integrated in the programmes as a gender variable. This would require a more explicit understanding of gender issues in village chicken production systems through gender analysis. Gender and gender roles are two key concepts which have been defined by FAO's Women and Population Division as follows:

FIGURE 1
Village chicken production system: factors affecting system output at different levels



Gender refers not to women or men *per se*, but to the relations between them, both perceptual and material. Gender is not determined biologically, as a result of sexual characteristics of either women or men, but is constructed socially. It is a central organizing principle of societies and often governs the processes of production and reproduction, consumption and distribution. Gender roles are the “social definition” of women and men, and vary among different societies and cultures, classes and ages, and during different periods in history. Gender-specific roles and responsibilities are often conditioned by household structure, access to resources, specific impacts of the global economy, and other locally relevant factors such as ecological conditions.

Chapter 2 presents an in-depth review of past research

and development work on rural poultry and its impact on village chicken production systems in Africa. Chapter 3 describes the field study conducted in four countries: Ethiopia, the Gambia, the United Republic of Tanzania and Zimbabwe. In Chapter 4, the relevance of computer modelling as a decision support tool in planning village chicken production improvement programmes is presented, as well as a spreadsheet model for identifying key variables in data collection and studying input-output relationships in village chicken production. Chapter 5 presents general discussions and suggestions for strategic improvement programmes for enhanced village chicken production systems. Finally, Chapter 6 gives the conclusions of the study and future prospects for village chicken production systems in Africa.

Chapter 2

Literature review

OVERVIEW

Literature databases used in the search that formed the basis of this review are:

- CAB International (CABI, 1972-1995);
- Agriculture On-line Access (AGRICOLA, 1984-1997);
- Abstracts on Tropical Agriculture and Abstracts on Rural Development in the Tropics (TROPAG & RURAL, 1990-1996);
- International Information System for the Agricultural Sciences and Technology (AGRIS);
- Food Science Technology Abstracts (FSTA, 1969-1997);
- Economist Intelligence Unit (EIU): country reports, sub-Saharan Africa.

Other sources of information were rural poultry workshop and seminar proceedings; technical reports on rural poultry improvement programmes; and theses and dissertations obtained from FAO headquarters, the University of Reading, United Kingdom, the University of Hohenheim, Stuttgart, Germany and Sokoine University of Agriculture, Morogoro, the United Republic of Tanzania.

The volume of literature showed that there is a paucity

of data on rural poultry stored in readily accessible systems. Bessei (1988) reported inaccessibility of information on rural poultry production as a major constraint to development. Classification of the citations by publication year and type of publication produced the trend shown in Figure 2.

As shown in Table 2, FAO and other development agencies have increasingly promoted the development of rural poultry through expert consultation meetings, workshops and seminars.

In 1989 the formation of the African Network for Rural Poultry Development (ANRPD) was proposed in an international workshop on rural poultry production in Africa at Ile-Ife, Nigeria, and this proposal was endorsed in 1990 in a seminar on smallholder poultry production, in Thessaloniki, Greece (Table 2). The formation of the network, which has technical and financial backing from FAO, was a major milestone in rural poultry development in Africa. One of the main activities of ANRPD has been the production of a newsletter as a medium for dissemination of information and developments in rural poultry in Africa. Annex 1 shows the international poultry periodicals. Most of

FIGURE 2
Trend of literature on village chicken production systems



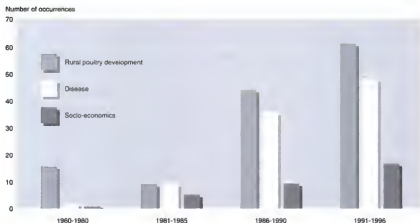
TABLE 2

International workshops and seminars on rural poultry, 1987-1996

Year	Workshop title
1961	FAO Expert Consultation on Rural Poultry and Rabbit Production, Rome, Italy, 30 November to 3 December 1961 (French and English sessions)
1965	FAO Expert Consultation on Rural Poultry and Rabbit Production, Rome, Italy, 10 to 13 December 1961 (French and English sessions)
1985	Poultry Production in Hot Climates, 2nd OLG Symposium on Poultry Production in Hot Climates, Special Working Group on Smallholder Poultry Production in Africa, Hanover, Germany
1987	FAO Expert Consultation on Rural Poultry Development in Asia, Dhaka, Bangladesh, 23 to 28 March 1987
1987	Poultry Production in Hot Climates, 3rd OLG Symposium on Poultry Production in Hot Climates, Hameln, Germany, 12 June 1987
1989	Poultry Production in Hot Climates, 4th OLG Symposium on Poultry Production in Hot Climates, Hameln, Germany, 19 to 22 June 1989
1989	FAO International Workshop on Rural Poultry Development in Africa, Ile-Ife, Nigeria
1990	CTA International Seminar on Smallholder Rural Poultry Production Requirements for Research and Development, Thessaloniki, Greece, 9 to 13 October 1990
1991	Newcastle Disease Vaccines for Rural Africa, Ombre Zeil, Addis Ababa, Ethiopia, 22 to 26 April 1991
1991	International Seminar on Newcastle Disease Vaccination of Village Poultry in Africa and Asia, Antwerp, Belgium, 13 to 14 February 1991
1991	ACIAR International Workshop on Newcastle Disease in Village Chickens, Control with Thermostable Oral Vaccine, Kuala Lumpur, Malaysia, 6 to 10 October 1991
1991	FAO Expert Consultations on Quality Control of Veterinary Vaccines in Developing Countries, Rome, Italy, 2 to 6 December 1991
1992	Village Poultry Production in Africa, 7 to 11 May 1992
1995	Smallholder Rural Poultry and Sustainable Development in Africa: Empowering Women, Generating Income and Employment, Improving Nutritional Status, Addis Ababa, Ethiopia, 13 to 16 June 1995
1995	Symposium on Newcastle Disease Vaccines for Village Chickens, Oosterstepoort, South Africa, 6 to 9 December 1995
1996	Symposium on Rural Poultry Development, 20th World Poultry Congress, New Delhi, India, 2 to 6 September 1996

these periodicals publish academic and scholarly articles, and some publish trade information for a target group. The ANRDP workshop in Addis Ababa, Ethiopia recommended collation of the grey literature on rural poultry and its publication in mainline scientific journals, publications and books (ANRPD, 1995).

Another trend observed in the present review (Figure 3) is that there has been little basic research on various aspects of rural poultry in Africa, except for diseases. As such, most of the citations were general studies of rural poultry development. In the last two decades, socio-economic studies have been incorporated in

FIGURE 3
Rural poultry topics

some programmes, which is possibly a result of the recent introduction of user differentiation and participatory approaches in research and development.

VILLAGE CHICKEN PRODUCTION AND HEALTH

Genetic resources

According to Horst (1988), the genetic resource base of the indigenous chickens in the tropics is rich and should form the basis for genetic improvement and diversification to produce a breed adapted to the tropics. Horst (1988) described nine major genes of the indigenous chicken (Table 3) that can be used in genetic improvement programmes. There is little information on the genetic make-up of the indigenous chickens of Africa. However, information collated in the FAO Domestic Animal Diversity Information System (DAD-IS) shows that these genes are prevalent in the local populations across the African countries (Table 4).

Information on the use of the morphological marker genes given in Table 3 for genetic improvement is scanty. Mathur, El-Hammady and Sharara (1989) reported an increase in egg production through incorporating naked neck (Na) genes in a crossbreeding programme of local Fayoumi. Similarly, Horst and Mathur (1992) reported favourable effects of naked neck (Na) and frizzle (F) genes on egg production and egg weight and of the dwarf gene (dw) on feed efficiency of chickens under heat stress.

Apart from the Fayoumi breed developed in Egypt (Hossary and Galal, 1995), there appears to be no record of a tropical adapted breed developed from indigenous chickens in Africa. A programme to produce such a breed in Nigeria failed after introducing a systematic approach of upgrading the breed by replacing the local cocks with Rhode Island Red (RIR) cocks (Oluyemi, Adene and Ladoye, 1979). The RIR cocks in the Nigerian programme succumbed under the poor rural conditions (Adegbola, 1988). Similar observations on genetic improvement programmes based on the introduction of exotic genes in local populations through cockerel exchange, supply of pullets or hatching eggs have been reported in Malawi (Safalaou, 1997), the Niger (Kaiser, 1990) and the United Republic of Tanzania (Katule and Mgheni, 1990). Fayoumi has been introduced in other tropical countries such as Ethiopia (Swan, 1996), the United Republic of Tanzania (Katule, 1989) and Bangladesh (Jensen, 1996).

Currently there is a major global thrust on genetic preservation and biodiversity which is reflected in efforts on development of genome and data banks (National Research Council, 1993; Crawford and

Gavora, 1993). These initiatives have come at an opportune time, because continued cross-breeding programmes in rural poultry, which do not consider gene preservation aspects, would lead to erosion of the indigenous germplasm (Bessei, 1989).

Feed resources

Feed resources are a major input in poultry production systems, estimated to account for about 60 percent of total production costs in the commercial poultry sector (Renkema, 1992). In village chicken production systems, it is difficult to estimate the economic and/or physical value of this input because there are no direct methods of estimating the scavenged feed resource which constitutes most of the feed input. Roberts and Gunaratne (1992) asserted that productivity of village chickens is determined by the relationship between the biomass of the chicken population and the scavenging feed resource base. These authors gave two methods for estimating the capacity of the scavenging feed resource using data collected in Sri Lanka. The first method was based on measurement of household refuse and chemical composition of crop contents using the formula:

$$SFRB = H/P \times n(n-1),$$

where

SFRB = scavenging feed resource base;

H = amount of household waste per family per day (kg dry weight);

n = number of families in the community;

x = number of families in the community that do not keep chickens;

P = proportion of the crop content that is household refuse, determined by visual inspection.

The second method suggested by the same authors used production levels of the flock. In this method, the daily consumption of the SFRB was described by the formula:

$$SFRB = \Sigma E_j/E_s,$$

where

j = the average number of birds in the family flock, obtained in a survey;

E_j = the ME requirement for the daily maintenance and production of each bird per day (kcal/kg dry weight), calculated from production data of growth rate and egg production such as that given by the National Research Council (1984);

E_s = the ME in the scavenging feed (kcal/kg dry weight) from crop content measurement.

Production data of growth rate and egg production are calculated with the National Research Council (1984) formula:

TABLE 3

Major genes in local fowl populations, with side-effects on tropical tolerance

Gene	Mode of inheritance	Direct effects	Indirect effects
dar: dwarf	Recessive, sex-linked, multiple allelic	Reduction of body size 10-30%	Reduced metabolism, improved fitness and disease tolerance
Na: naked neck	Incomplete dominant	Loss of neck feathers, reduction of pteriae width, reduction of secondary feathers	Improved ability for convection, reduced embryonic livability (hatchability), improved adult fitness
F: frizzle	Incomplete dominant	Curling of feathers, reduced feathering	Decreased fitness under temperate conditions, improved ability for convection
h: silky	Recessive	Lack of hamuli on the barbules, delicate shafts, long barbs of contour feathers	Improved ability for convection
K: slow feathering	Dominant, sex-linked, multiple allelic	Delay of feathering	Reduced protein requirement, reduced fat deposition during juvenile life, increased heat loss during early growth, reduced viability
ld: non-inhibitor	Recessive, sex-linked, multiple allelic	Dermal melanin deposition in the skin and shanks	Improved ability for radiation from shanks and skin
Fm: fibro-melanosis	Dominant with multifactorial modifiers	Melanin deposition: all over the body, sheaths of muscles and nerves, tendons, esenterum, blood vessel walls	Protection of skin against UV radiation, improved radiation from the skin, increased pack-cell volume and plasma protein
P: peacomb	Dominant	Change of skin structure: compact comb size; reduction of pteriae width; development of breast ridges	Improved ability for convection, increased frequency of breast blisters, sex-limited (c) improvement of late juvenile growth
O: blue shell	Dominant, sex-linked	Deposition of blue pigment (biliverdin IX) into egg shell	Improved egg shell stability

Source: Hone, 1988.

$$ME \text{ per bird daily} = W^{0.75}(173 - 1.95T) + 5.5\Delta W + 2.07EE,$$

where

W = body weight (kg);

T = ambient temperature (°C);

 ΔW = change in body weight;

EE = daily egg mass (g).

Using the first method, the scavenging food resource base (SFRB) was estimated to be 203 kg dry weight per family per year, with 23 kg protein and 609 Mcal ME in the Sri Lanka studies. Other studies in Southeast Asia (reviewed by Roberts and Gunaratne, 1992), reported SFRB yields of 475 kg per family per year in Indonesia (Kingston and Creswell, 1982) and 390 kg per family per year in Thailand (Janviriyasopak *et al.*, 1990). With an ME and protein requirement of 11 kcal per hen per day and 11 g protein per hen per day, the protein and energy production levels of SFRB per household estimated in the Southeast Asia studies show that the SFRB energy levels would maintain only two hens. These observations suggest that interventions increasing the village flock size, such as disease control or the introduction of high-yielding cross-breeds, must be accompanied by interventions to increase the SFRB.

In the Sri Lanka studies, the village chicken feed was partitioned into household refuse, 72 percent; grass shoots, 13 percent; small metazoans, 8 percent; and paddy rice, 7 percent. The household refuse was further

partitioned into coconut residues, 30 percent; broken rice, 8 percent; and sundries (vegetable trimmings, egg shells, bread, dried fish and scaps), 36 percent. In Ethiopia, no attempt was made to estimate the yields of the household refuse. However, analysis of the crop contents of the chickens showed a high proportion of seed material – 40 percent (Ngesse, 1992).

There has been more research work on qualitative and quantitative characteristics of scavenging feed resources in Asia (Ravindran and Rajaguru, 1985; Roberts, 1991; Gunaratne *et al.*, 1992; Ravindran and Blair, 1993) than in Africa. Ravindran and Blair (1993) gave a detailed description of novel energy and protein resources for scavenging chickens. Similarly, Reddy and Quadratullah (1996) in their discussion on strategy feeding supplementation through locally available resources, provided production and qualitative characteristics of unconventional feeds. The nutritional value of these novel sources was high, e.g. the amino acid content of fly pupae was comparable with that of bone meal and fish meal. In Southeast Asia, some of the unconventional feed resources such as golden snail (*Pila leopoldvillensis*) have been incorporated in commercial poultry feeds (Ngoupayou, 1993).

In Africa there is little information about research on unconventional feed resources for poultry. Musharaf (1990), reviewing literature on feed resources for small-scale poultry production, included data on tropical crops such as cassava (*Manihot utilissima*),

TABLE 4
Identifiable characteristics of indigenous chickens in Africa

Country	Local name	Identifiable marker genes	Mature male weight	Mature female weight	Other visible traits
Burkina Faso	Cou nu, Joub-kole	Ni: naked neck F: frizzle	1.5	1.2	Thermo-resistance, resistance to some diseases
Chad	Chicken of Moulikou and Bongor	P: peacomb	1.5	1	—
Chad	Dydedi	P: peacomb	1.5-2	1-1.5	—
Ghana	Local Ghanaian	Ni: naked neck F: frizzle P: peacomb	1.2	1.1	Disease resistance
Lesotho	Basotho	P: peacomb	1.8	1.6	Resistance to internal parasites
South Africa	Kaahlekke	Ni: naked neck	—	—	—
Swaziland	Inkhukhu	Ni: naked neck	2.1	1.6	—

Source: DAD-IS

plantain (*Musa sapientum*) and yam (*Dioscorea rotundata*) meals as unconventional energy feed resources. The review also included information on protein sources that are not used conventionally in commercial poultry feeding: palm kernel meal, cashew nut meal and African locust bean seed and pulp.

Sonaiya (1993) reported chemical analysis of 20 unconventional foodstuffs, which were mostly by-products of food processing and preparation, such as fermented cassava chaff, ripe plantain, melon pulp, amaranthus seeds, broken cowpea and palm oil sludge. In the study by Sonaiya (1993), 50 percent replacement of a commercial grower ration using a simple ration formulated with palm oil sludge had no significant effect on the growth rate, intake and feed efficiency of commercial cockerels raised in cages. The unconventional ration was also cheaper than grain. Most of the research on these foodstuffs (reviewed by Musharaf, 1990; Sonaiya, 1993) has been based on intensive poultry production units.

Various techniques to produce unconventional feed resources in the tropics have been described, although on a small-scale basis. At village level, Farina, Demey and Hardouin (1991) described a technique used by villagers in Togo to produce eggs and larvae of termites for poultry feeding. Fibrous wastes such as maize, sugar cane and millet stovers were used as substrates and were covered with clay pots or jute sacks on an ant hill. The termites were harvested after three to four weeks and fed to chicks. Similarly, Soukossi (1992) describes a technique of producing maggots in Burkina Faso using maggot culture tanks of 1 m³, filled with water, adding cereal stovers and poultry droppings as substrate. The larvae that developed five to ten days later were harvested and fed to poultry. Forages also

form part of the scavenged feed resource. Perez (1997) reported on the use of green-feed cassava and soya forage in a 50:50 ratio to substitute commercial feeds. Baksh (1994) suggested an example of an integrated poultry cropping system where a rotation design is used to produce vegetables and poultry products.

Health and disease control

Major diseases of poultry in Africa that have been predominantly identified in commercial poultry are Newcastle disease (ND), infectious bursal disease (IBD) or Gumboro, Marek disease (MD), fowl typhoid, cholera, mycoplasmosis and coccidiosis (Adene, 1996). However, Chabeuf (1990) argued that the most devastating disease of village chickens in Cameroon is ND, whereas in commercial poultry, coccidiosis, MD and IBD are more prevalent. Research work in other African countries such as Benin (Chrysostome *et al.*, 1995), Burkina Faso (Bourzat and Saunders, 1990), Mauritania (Bell, Kane and Le Jan, 1990) and the United Republic of Tanzania (Yongolo, 1996) supports the argument that ND is the most devastating disease of village chickens.

Other health problems in village chickens are external and internal parasites. A study on ectoparasites of domestic fowls in Nigeria showed that lice, *Menacanthus stramineus*, was the major problem in rural poultry (Zaria *et al.*, 1993). In this Nigerian study, the external parasite problem was associated with season – higher rates of infestation occurred during the rainy season.

A study on the incidence of worms in chicken farms in Nigeria found that the most common species were *Ascaridia galli*, *Prosthogonium* spp., *Strongyloids avium* and *Heterakis gallinarum* (Tona, 1995). *Raillietina* spp. and *Davainea proglottina* occurred only in free-range chickens. In the United Republic of

Tanzania, a survey on the prevalence of helminths in village chickens showed a high incidence of *Tetrameres americana*, *Heterakis gallinarum* and species of *Heterakidae*, *Trichuridae* and *Raillietinidae* (A. Permin, 1996, unpublished).

In view of the above, it is not surprising that Newcastle disease is the most researched disease in village chickens. There is an extensive literature on the epidemiology and control of ND as reviewed by Alexander (1991), Awan (1993) and Yongolo (1996). In 1991, FAO sponsored an international workshop on production and quality control of ND vaccines for rural Africa (Rweyemamu *et al.*, 1991). Recently, there has been increasing concern on control of ND in village chickens, stimulated by the introduction of a thermostable orally administered vaccine (V4) in Southeast Asia, mainly supported by ACIAR (Copland, 1987).

A number of countries have carried out virus isolation and obtained virulent strains (Table 5). Country reports in a symposium on ND vaccines for village chickens indicated that the disease is endemic in Zambia, Malawi, the United Republic of Tanzania, Uganda, Namibia and Botswana. Zimbabwe was reported to be an ND-free country until the first outbreak in 1967, which was controlled after two years. According to Huchzermeyer (1993), the 1967 outbreak was halted by a single vaccination with a killed aluminium hydroxide-absorbed ND vaccine and strict movement control. There were further outbreaks in 1986 and 1994, and recently there have been more sporadic outbreaks, particularly in village chickens.

Alexander (1991) noted that global regulation and control of ND is influenced by the growing multinational poultry trading industry involving poultry products and genetic stock. Furthermore, uncertainties associated with different countries making an open declaration of ND to international agencies such as the International Office of Epizootics (OIE) has limited worldwide control of the disease.

Major factors associated with the transmission of ND in village chickens are exposure to the natural environment, including wild fauna; flocks of various ages and susceptible new hatches (Chabeuf, 1990; Olahode *et al.*, 1992); and contact through either exchange of live chickens and products or movement between households and villages. In an experiment to study transmission of ND in village chickens, Huchzermeyer (1993) ruled out airborne spread of ND in village chickens in the tropics, and asserted that transmission is mainly through contact. Similarly, Martin

and Spradbrow (1992) noted that transmission by air is unlikely, because a large number of chickens is necessary to generate sufficiently dense aerosol for such transmission. Therefore, bird-to-bird contact would seem to be the most important mode of transmission in tropical and subtropical production systems.

The recent development and use of thermostable vaccine (NDV4) has created fresh interest for the control of ND in village chickens (Copland, 1987; Spradbrow, 1990; Spradbrow and Samuel, 1991). In Africa, a number of countries have introduced the vaccine on a trial basis. A major concern has been the identification of appropriate food carriers to introduce the vaccine. Virucidal activity of some grains that reduce the effectiveness of the vaccine have been reported by Rehmani, Spradbrow and West (1995). Jayawardane, de Alwis and Bandara (1990) reported using cooked rice as a carrier for the V4 vaccine. Laboratory virus recovery trials in Zimbabwe demonstrated good virus recovery in pearl millet, sunflower, finger millet and sorghum. In the same trials, barley gave poor results, while crushed and cooked maize exhibited intermediate virus recovery (Department of Veterinary Services, Zimbabwe, unpublished report).

The development of poultry health programmes requires reliable information on the epidemiology of diseases, which is lacking in village chicken production systems (Pandey, 1993). Disease surveillance is further limited by poor infrastructure and communication, as well as inadequate diagnostic facilities. These limitations have resulted in underreporting of disease outbreaks, as observed for ND in the United Republic of Tanzania (Yongolo, 1996). James (1997) cautioned that the animal health status of countries given by the FAO/OIE/WHO *Animal Health Yearbook* is based on a passive reporting system and that lack of reporting does not necessarily mean the disease is absent. In the same context, the latest OIE report on ND presence showed that only two countries in Africa, South Africa and Swaziland, reported the presence of the disease.

Newcastle disease is probably the only disease identified by farmers in rural areas on the basis of clinical signs. Therefore, ND has acquired specific local names such as *Fengle* or *Enkuref* in Ethiopia, *Pappa* in Mauritania (Bell, Kane and Le Jan, 1990), *Kideri*, *Mdonde*, *Mdondo*, *Sotoka ya kuku*, *Kifwa* or *Ikula* in the United Republic of Tanzania (Yongolo, 1996) and *Chibwububu* in Zimbabwe (farmers in Zimbabwe, personal communication). Development of appropriate surveillance standards to support farmer

TABLE 5
Newcastle disease research on village chickens in Africa

Reference	Country	Type of research	Remarks
Jagne <i>et al.</i> (1991)	Malawi	Village vaccination trials using V4 vaccine pellets	Haemagglutination inhibition (HI) tests showed 30% and 48% seroconversion of birds vaccinated at 4 and 12 weeks, respectively
Bell (1991)	Morocco, Mauritania, Cameroon, Benin	Serology studies and ND virus isolation, village vaccination trials	Velogenic virus identified; HB1 vaccine in eyedrop delivery gave better protection than inactivated vaccine (Newcavac)
Bell <i>et al.</i> (1995)	Cameroon	Vaccination trial in village poultry, NDV4 given by eyedrop	Vaccinated chickens maintained an HI titre of at least log ₃ for 12 weeks after vaccination
Yongolo (1996)	United Republic of Tanzania	Epidemiological and serological studies, and virus isolation	Highly significant seroprevalence differences in the factors: velogenic, mesogenic and lentogenic paramyxovirus identified
Ahlers and Hutterer (unpublished)	Malawi	Vaccination trials comparing live (V4) and inactivated (Newcavac) vaccines	Both vaccines had good immune response but Newcavac had higher horizontal spreading of V4 observed
Adu, Tomori and Oyejide (1990)	Nigeria	Tested efficacy of three vaccines: Hitchner B1, Lasote and Komarov	Vaccine to use depends on the virulence of the NDV strains, Komarov produced more solid immunity
Alders, Inoue and Katongo (1994)	Zambia	Serology studies, vaccination trials with HB1 and V4	Vaccination with V4 gave higher HI titres than with HB1
Loreti (unpublished)	United Republic of Tanzania	Laboratory trial testing efficacy of NDV4 by eyedrop delivery	Vaccinated birds had HI titres, of log ₉ to log ₁₀ ; all vaccinated birds resisted challenge
Foster (unpublished)	United Republic of Tanzania	Village trials with NDV4, testing three delivery methods	Eyedrop and drinking-water methods gave the highest titres of log ₄ , 2, delivery in food had low titre, log ₂ 3, unvaccinated birds had a titre of log _{0.6}
FAO (1996)	Ethiopia, the Gambia	Vaccination trials using V4 administered orally	In Ethiopia, results on best food carrier were inconclusive; in the Gambia cooked rice was more effective than millet as food carrier

identification would enhance an active disease reporting system in village chicken production systems. Use of rapid tests in identifying poultry diseases at farm level has been suggested by various workers as one of the strategies to enhance disease control in rural poultry (Bell, 1991; Verma, 1996). A newly initiated coordinated research programme on increasing farmyard poultry production in Africa initiated by the Joint FAO/International Atomic Energy Agency (IAEA) Division of Nuclear Techniques in Food and Agriculture, supporting the use of enzyme-linked immunosorbent assay (ELISA) in serological ND screening, will probably enhance disease control (ANRPD, 1997).

Housing

Housing in modern poultry is an important input, accounting for a major component of the initial capital investment. In modern poultry enterprises, the structures are constructed and designed in consideration of bird welfare and efficiency of production (Weaver, 1996; Bhagwat, 1996). Housing in rural poultry is at a rudimentary stage, and field surveys have shown cases where no housing or shelter is provided (Huchzermeyer, 1973; Kuit, Traore and Wilson, 1986; Atunbi and Sonaiya, 1994; Yongolo, 1996). Housing practices for rural poultry in Africa are reported to be influenced by the prevailing farming system, with major differences between the pastoral farming systems and the agro-

pastoral or sedentary systems (Kuit, Traore and Wilson, 1985).

Research on the economic efficiency of housing in rural poultry in Africa is scanty. However, published reports suggest that where housing is provided to village chickens, the houses are made with locally available materials such as wood, mud bricks, sugarcane stems, bamboo and cereal stovers (Atunbi and Sonaiya, 1994; Huchzermeyer 1973; Yongolo, 1996). In an evaluation of the economic efficiency of the local materials for housing chickens, Atunbi and Sonaiya (1994) reported that cane cages were cheaper than wooden cages.

VILLAGE CHICKENS IN HOUSEHOLD AND NATIONAL ECONOMIES

The importance of rural poultry in national economies of developing countries and its role in improving the nutritional status and incomes of many small farmers and landless communities has been recognized by various scholars and rural development agencies in the last two decades (FAO, 1982, 1987; Bembridge, 1988; Creevey, 1991; Mokotjo, 1990). However, rural poultry does not rate highly in the mainstream national economies because of the lack of measurable indicators of its contribution to macroeconomic indices such as gross domestic product (GDP). Economic valuation of livestock at household and national levels is

complicated by the multiple functions of livestock in the economy. Moreover, estimating the value of rural poultry is even more difficult than for other livestock because of the lack of reliable production data. Mutizwa-Mangiza and Helmsing (1991), in assessing the contribution of various components of the rural farming system to household subsistence in Zimbabwe, could not estimate that for the livestock production subsystem, although the study concluded that diversification, including keeping of livestock, increased household food security. Similarly, in the Gambia, a national agricultural survey had to omit the poultry component owing to lack of measurable indicators for this sector (Y. Jalo, personal communication).

The rural poultry population in most African countries accounts for more than 60 percent of the total national poultry population, which has been accorded an asset value of US\$5 750 million (Sonaiya, 1990a). In Burkina Faso, Ouandaogo (1990) reported that the 25 million rural poultry produce 15 000 tonnes of meat, out of which 5 000 tonnes are exported at a value of US\$19.5 million, mainly to Côte d'Ivoire. Forssido (1986) estimated that village chickens provide 12 kg of poultry meat per inhabitant per year, whereas cattle provide 5.3 kg per inhabitant.

Village chickens are more widely distributed in rural Africa than the other livestock species. In the United Republic of Tanzania, a survey of 600 households in 20 villages showed that chickens were the only form of livestock found in most households (Collier *et al.*, 1986). Similar observations have been reported in the Niger (Abdou and Bell, 1992), in Ghana (van Veluw, 1987) and in Mali (Kuit, Traore and Wilson, 1986).

Surveys in some African countries have reported that the main function of village chickens from the farmer's perspective is the provision of meat and eggs for home consumption [Mali (Kuit, Traore and Wilson, 1986); Ghana (van Veluw, 1987); the United Republic of Tanzania (Kabatange and Kutule, 1989); South Africa (Cairns and Lea, 1990); the Gambia (Andrews, 1990); the Niger (Abdou and Bell, 1992) and Côte d'Ivoire (Diambra, 1990)]. Apart from increased quantitative production of animal protein in rural households, chicken meat and eggs provide protein of a higher biological value than that of red meat (Norman, 1973). Chicken meat and eggs are reported to complement staple diets of rural Africa due to the higher nutrient concentration (Table 6). Small poultry production units of 12 laying hens per unit have reported an increase in the consumption of animal protein and reduced incidence

TABLE 6

The amount of nutrients provided by 100 g (edible portion) of poultry meat, eggs and other selected staple foods of Africa

Food item	Energy (kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (µg)
Egg (fresh)	156	12.1	56	2.1	156
Poultry meat	139	19.0	15	1.5	0
Maize flour, whole	353	9.3	10	2.5	0
Rice, polished	361	6.5	4	0.5	0
Cassava flour	344	1.6	66	3.6	0
Sorghum	345	10.7	26	4.5	0
Plantain	136	1.2	8	1.3	390

Source: FAO, 1997c.

of malnutrition in resource-poor households of South Africa (MacGregor and Abrams, 1996).

Rural poultry is also an important element in diversifying agricultural production and increasing household food security. The village chickens provide readily harvestable animal protein to rural households, and in some parts of Africa are raised to meet the obligation of hospitality to honoured guests (Figure 4). Chale and Carloni (1982) reviewed the attributes of chicken meat and eggs in rural areas. Egg dishes and chicken meat cook faster than pulses and red meat, and therefore use less fuelwood. In the same review, citing poultry projects in Asia and Africa, the authors highlighted the importance of chickens as a diversification component in rural farming systems, particularly for women. Income accrued from the sale of eggs in a women's project in the Sudan was used to purchase household consumable goods, thus increasing household welfare. Gittinger, Leslie and Hoisington (1987), in a survey on food production by women and its impact on food security, found that rural households that had cropping as their only source of food production were more food insecure than households that had livestock, including poultry. Similarly, Bembridge (1988), assessing the impact of a maize extension programme based on a survey of farmers' needs, indicated that diversification including poultry would be beneficial to women.

The advantages of household poultry in improving household food security and increasing household welfare have been reported in other regions. In India, Desai (1996) reported successful rural poultry projects involving women, which led to increased production and empowering of women through provision of training

and credit. Similar projects have been reported in Thailand and Honduras (FAO, 1994; Bradley, 1996), as well as Bangladesh (Saleque and Mustafa, 1996). The importance of organizational and capacity building in enhancing increased rural women's poultry production featured highly in the projects in Asia and Latin America.

The recent developments in the importance of poultry in household food security, especially for the poorer members of the community, including increased distribution of resources through involvement of women, have been appreciated globally. Household poultry has been included in the FAO Special Programme for Food Security (SPFS) (FAO, 1997b), endorsed in the Rome Declaration and World Food Summit Plan of Action in November 1996 (FAO, 1997a).

The participation of women in rural poultry improvement programmes contributes to human development both by increasing access for rural women to income and knowledge, and by increasing production efficiency (Aboul-Ella, 1992; Bradley, 1992; Scola, 1992). In a recent review, Bradley (1996) suggested that increased contribution of poultry production in national economies through the involvement of women will be attained primarily through explicit incorporation of gender issues in such programmes, thus involving rural women directly in rural development. Similarly, Kitalyi (1996) suggested that transformation of the village chicken production systems of Africa into economically viable enterprises would require better understanding of the socio-economic aspects of the production system.

FIGURE 4
Village chickens provide readily harvestable animal protein to rural households



Chapter 3

Field study

LOGISTICAL DATA FOR CASE STUDY COUNTRIES

Four African countries, Ethiopia, the Gambia, the United Republic of Tanzania and Zimbabwe (Figure 5) were selected for the field study. These countries were selected on the basis of their earlier involvement in rural poultry improvement programmes supported by FAO. Field visits in the present study were centred on the villages involved in the FAO programmes. In the Gambia, additional visits were made to villages involved in the United Nations Development Programme (UNDP) women-in-development (WID) project GAM/91/002, "Improving extension services for women". Results from the present study were used to describe the village chicken production systems in the different countries. Although some comparative views are given, further interpretation should reflect the country differences in structural conditions, rural development objectives and strategies (Table 7).

DATA COLLECTION TECHNIQUES

Field data were collected during short missions to the four countries (Annex 2). In Ethiopia, the Gambia and the United Republic of Tanzania, data were

collected through informal interviews with key informants, national researchers, extensionists and non-governmental organizations (NGOs) working on rural development and farmer interviews in selected villages.

The villages were selected by scientists in the host country, mainly on the basis of actual participation in rural poultry improvement programmes.

Participatory rapid appraisal techniques (Paris, 1994) were used to collect gender disaggregated data on ownership pattern, division of labour and decision-making in village chicken management aspects using the guidelines shown in Annex 3. Hen production data, based on hen history, were collected in individual household surveys (Annex 4). In the United Republic of Tanzania, a market survey was conducted using the guidelines shown in Annex 5, to collect information on village chicken marketing and the participation of the different gender categories.

In Zimbabwe, a structured questionnaire for collection of socio-economic data was designed and adapted by FAO project TCP/ZIM/4553, "Emergency assistance for the control of Newcastle disease in Zimbabwe" (Rushton, 1996b). With technical input by an FAO consultant, Dr Jonathan Rushton, the questionnaire format was modified to facilitate data management, which included on-the-spot cross-checking of data accuracy and data storage (Annex 6). Annexes 7 and 8 show guidelines for collecting cross-sectional data used in the Zimbabwe project. Initial plans for participation in field data collection in the Zimbabwe project were not realized because of delays in the start of the project.

DATA ANALYSIS

The qualitative data collected were subjected to the process of data reduction to obtain an organized assembly of information which was stored in a spreadsheet program. The summarized information was classified and analysed using pie charts and histograms. Descriptive analysis was conducted on the hen production data collected from individual household surveys.

FIGURE 5
The case study countries



TABLE 7
Logistical data

Country	Salient features of the national economy and rural development strategies	Rural versus commercial poultry sectors
Ethiopia	Major changes in development strategies result from policy changes from an authoritarian monarchy to a state-controlled economy in 1974, then to a free market economy in 1991 Agriculture accounts for over 50% of national economy, 20% of which from livestock Peasant and producer association introduced during the centrally planned economy period (1974-1991) Rural poverty widespread	Rural poultry contributes over 90% of the national poultry production Commercial poultry poorly developed
Gambia	Smallest country in Africa Migration in rural areas is common Less differentiation of institutions working for rural development Ratio of extension personnel to farm families is one of the highest Livestock improvement accorded high priority by the government's Economic Recovery Programme	Poultry does not feature much in the traditional livestock sector Recent rural poultry improvement programmes spearheaded by WID initiatives
United Republic of Tanzania	Development strategies emphasized equity and participation 1967-1972 dominated by centrally planned development, with formal village organizations Structural adjustment adopted in 1982 High income inequality and absolute poverty within and between villages	Over 80% of national poultry is in the traditional sector Chickens common in most households Commercial poultry poorly developed, no cold-chain system
Zimbabwe	Dominated by industrial sector, contributing over 35% to GDP Major rural resettlement and reconstruction after end of colonial rule in 1980 Traditional and subsistence agriculture account for only 15% of GDP, over 90% of marketed products come from commercial farms Rural development centred on growth points and service centres Labour migration to commercial farms, mines and urban areas common Income inequality, poverty and food insecurity common among communal households	Dominated by commercial poultry Rural poultry contributes 30% of total national poultry products Commercial poultry cold-chain system reaches some of the growth points and service centres

MAIN FINDINGS

Breed and type characteristics

Among the case study countries, only Ethiopia had a village chicken breed intervention activity. The villages Dembi-1, Kurkara-1 and Kurkara-2 participated in the continuing rural development project TCP/ETH/4455, "Training in rural poultry development". For this project, the pure RIR breed was introduced in the villages. Each participating household was given six RIR birds, three pullets and three cockerels, and these were mixed with the local flock. In the Gambia and the United Republic of Tanzania, there was no clear record of introduced exotic genes in the case study villages.

Although there was no distinct identification of the local chicken types, in all the case study countries identification was made on the basis of plumage colour. In Ethiopia, the local chickens were identified by plumage colour: black (Tikur), red (Kei), grey (Gebsuma) and white (Netch).

In group interviews, farmers in the Dodoma region, the

United Republic of Tanzania, said that there were marked differences in the type of chickens in the region. Naked-neck types were common and a local type known as Kuchi was described to be common in all of central United Republic of Tanzania. The history of the Kuchi could not be traced in the present study, but this type is known to be heavier than other local types.

Feeding and management systems

Table 8 shows the sites visited in the four countries and a description of the main features of the village chicken production systems. In Ethiopia, all the households visited had no separate housing for the chickens. However, within the family house there was an area marked for the chickens. In central United Republic of Tanzania, keeping chickens in the family house was common, but in Morogoro and Dar-es-Salaam, separate housing for chickens was common. In the Gambia and Zimbabwe, the use of separate houses for the chickens was more common than keeping the chickens in the family house.

TABLE 8
Village chicken production: main features of flocks

Country	Provinces/regions visited	Number of households interviewed	Flock size range	Housing	Feeding
Ethiopia	Ada'a Woreda, Eastern Shoa	12	6-15	Same as household members	Scavenging and hand feeding of grains (wheat and barley)
Gambia	Western Division, West Bank Division, North Bank and Central River Division	15	6-45	Separate housing	Scavenging and homemade ration
United Republic of Tanzania	Dar-es-Salaam, Dodoma and Morogoro	24	6-130	Same and separate	Scavenging, hand feeding of grains plus homemade ration (household ingredients and commercial feed)
Zimbabwe	Mashonaland East and Masvingo	17	2-38	Separate	Scavenging and hand feeding

The housing structures in the Gambia, the United Republic of Tanzania and Zimbabwe were similar. They were small and low and had very small outlets. Photos 1 and 2 illustrate traditional housing structures in the Gambia and improved communal housing with improved aeration and wider entrances for easy cleaning. The improved housing was developed as part of the Switzerland/UNDP project "Enhancing rural capacities through livestock development". However, the small, low structures, also found in Zimbabwe and the United Republic of Tanzania, were associated with protection from theft. In Zimbabwe, the fowl run, which includes a fenced area for scavenging, was a common element of village chicken housing. However, not all village chicken structures in Zimbabwe had a fowl run.

Scavenging was the major feeding system in all case study countries. However, occasionally the chickens' food was supplemented with household refuse and grains (Photo 3). Preferential treatment, where chicks were fed separately, was reported in the case study countries, although the practice was not regular and the amount fed was not quantified. In the

Gambia, farmers have been trained to improve feeding of the chickens using readily available ingredients, including oyster shells and fish bones. Use of termites was also mentioned by farmers in the Gambia. However, none of the households interviewed had the mixture at the time of the field visit.

Table 9 shows the hen production data collected through the hen history interview from female farmers. In Ethiopia, the field visit coincided with the beginning of the rainy season, when incubation of laid eggs is not encouraged because there is poor hatching during this season. The farmers, therefore, use various techniques to prevent the hens from starting brooding. The methods used are based on distracting the hen from its normal pattern, such as changing its resting place. Various management techniques during brooding and rearing of chicks were reported along with the hen history data. This included selection of eggs for setting, preparation of nests, assisting with turning the eggs (particularly with big clutches) and introducing chicks to foster-mother hens known to have good mothering ability.

More data were available from the Gambia and the

PHOTO 1

Traditional poultry house in the Gambia



PHOTO 2

Introduced improved house in the Gambia



TABLE 9
Hen production data collected through individual household survey

Country	Number of households	Number of hens	Clutches recorded per hen	Eggs incubated	Hatchability	Chick mortality
Ethiopia	12	22	1.1	13±1.4	71±30	66±47.1
Gambia	15	57	3.2	13±0.7	71±7.3	19±26.5
United Republic of Tanzania	24	45	2.4	15±2.6	78±2.2	32.5±10.6

United Republic of Tanzania, probably because farmers visited in these two countries had bigger flocks and there was no seasonal hatching. The flocks were of varying ages, and during the interview the farmers were able to refer to the chicks or growers. In Ethiopia, the flocks had more mature stock and very few growers and chicks. This could account for the minimal information obtained in Ethiopia compared with the Gambia and the United Republic of Tanzania. In Ethiopia information given was for only one clutch per hen, whereas in the Gambia and the United Republic of Tanzania, the information was for 2.4 and 3.2 clutches per hen. Farmers interviewed in the Gambia had good recall of the hen history. This was attributed to their participation in the continuing rural poultry improvement programme.

The low chick mortality rates observed in the Gambia could be as a result of continuing livestock improvement interventions. Women farmers showed great interest in the project activities. In Ethiopia the high chick mortality was attributed to the problem of external parasites.

Marketing was mentioned as a major constraint in both the individual household and group interviews. None of the case study countries had organized marketing channels for chicken products. The chickens were sold live, both inside and outside the village. In Ethiopia and the United Republic of Tanzania, farmers used the existing trading centres, predominantly open markets, to sell their chickens. In the Gambia, the WID programme arranged specific marketing days for the farmers to sell their chickens. In Zimbabwe, the chickens were sold at the household level or along the main roads.

Information collected from two markets in Ethiopia (Dukam and Debre Zeit) showed that the offtake of chickens and the sale of eggs were highly influenced by national festivals. Prices of the chickens ranged from 6 to 20 birr (Br) (about US\$1 to \$3), with the highest price being fetched during the festival. The sale of eggs was a common practice in Ethiopia, whereas in the United Republic of Tanzania and the Gambia, the sale of eggs in the markets was not common.

Tanzanian farmers had different marketing channels for the village chickens: direct purchase by intermediaries at the household level, weekly village markets and fortnightly livestock markets. The livestock markets involved a number of villages, and buyers included traders from town and city markets. Supply in the United Republic of Tanzania was reported to be influenced by the cropping season. The supply was higher after the harvest, which marked the beginning of the dry season, and lower at the end of the dry season. Prices of live chickens in the United Republic of Tanzania ranged from 1 300 shillings (TSh) (approximately US\$2) at village level



PHOTO 3
Hand feeding the chicken flock, Zimbabwe



PHOTO 4
Buying and selling
of village chicken
products in Debre
Zeit market,
Ethiopia

to T Sh3 000 (approximately US\$5) at the city markets. Prices in the United Republic of Tanzania were much lower at the household level (less than T Sh1 000, i.e. approximately US\$1.6), and it was reported that buyers in town and city centres hired youths to buy the chickens at the household level. However, the local chickens had a premium price compared with the broiler chickens in towns.

The sale of chickens and eggs in the village markets was undertaken by both men and women (Photo 4).

Health and disease control

Farmers interviewed in the case study countries indicated diseases, and specifically ND, as the major constraint in village chicken production. However, in Ethiopia, external parasites, mainly fleas, were the major constraint at the time of the field visit, probably because the chickens were vaccinated against ND. In the Gambia the farmers interviewed had all participated in an ND vaccination programme for their village chickens, but they still indicated ND as the main problem in the village chicken production system. In the United Republic of Tanzania, one village in the Dodoma region, Chibelela, participated in an ND control programme executed by the Diocese of Central Tanganyika with financial support from the Australian Centre for International Agricultural Research (ACIAR).

Discussion with government extension officers indicated that there is no routine or regular village chicken health programme in place in any of the case study countries. Poor veterinary infrastructure and inadequate veterinary support services were mentioned as the main problems. Zimbabwe probably has the best infrastructure for delivery of veterinary services. Each district has a diagnostic laboratory equipped with minimum facilities for vaccine and drug storage (Photo 5). The epidemiology unit of the Zimbabwe Central Veterinary Laboratory carries out the disease mapping and operates the Geographic

PHOTO 5
Diagnostic laboratory at the Murewa District Veterinary Centre, Zimbabwe



Information System (GIS) in the country, and ND is one of the diseases covered. A map of ND outbreaks is produced on a quarterly basis for information and monitoring purposes (Figure 6).

The most recent interventions in the four countries have centred on ND control. In Ethiopia and the Gambia, an FAO-supported project, "Assistance to rural women in protecting their chicken flocks from Newcastle disease", TCP/RAF/2376, was implemented in 1994 and 1995 (Rushton, 1996a). The project's main objective was to introduce and evaluate under African rural conditions the heat-tolerant V4 oral ND vaccine, which had proved effective in Southeast Asia. Another objective was to involve rural women in the implementation with the aim of poverty alleviation.

A number of reports on the TCP/RAF/2376 project were produced by national scientists and international consultants (Annex 9) and are available from the

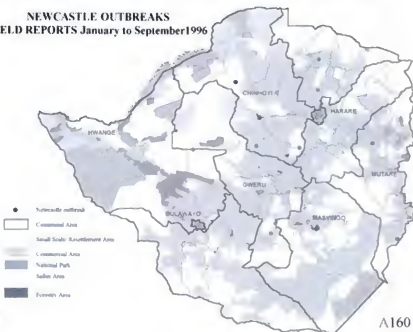
FAO Agriculture Department. In Ethiopia, wheat, maize and barley were selected for testing of their suitability as carriers for the vaccine, while in the Gambia, millet, unhusked rice, polished rice and cooked rice were tested. In the first year an increased level of protection from ND through oral vaccination with the heat-tolerant V4 vaccine ranging from 22 to 66 percent was reported (Palya, 1995). However, the results were not conclusive in the first year, and the project period was extended for another year to allow for more field trials.

The technical reports from project TCP/RAF/2376 in Ethiopia indicated that there were no conclusive results from the field trials on the effectiveness of the oral delivery of the vaccine in the field. Failure to obtain conclusive results was attributed to inadequate involvement of extension services and low farmer participation. Results from field trials were reported to be unreliable because the seromonitoring activity

FIGURE 6

Example of the map produced quarterly by the Zimbabwe Central Veterinary Laboratory to monitor Newcastle disease outbreaks

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was not successful (G.Y. Mebratu, unpublished). However, positive results were reported from the laboratory vaccine trial (M. Yami, unpublished), which showed 100 percent protection levels for ocular-vaccinated birds and those given barley-based V4 vaccine. Lower protection levels were reported for maize (55 percent) and wheat (22 percent).

In the Gambia, cooked rice was reported from on-station trials to produce the highest protection relative to unhusked rice and millet, while in field trials, unhusked rice gave the highest protection (B. Jaw, unpublished).

A spillover effect of the project TCP/RAF/2376 was reported in a sister project in Ethiopia, "Training in rural poultry development", TCP/ETH/4455. Results of laboratory trials from project TCP/RAF/2376 were used as an input to the training of vaccinator trainers in 12 villages under project TCP/ETH/4455.

In the Gambia, project TCP/RAF/2376 was followed up with other ND control programmes using other ND vaccines. A UNDP project, GAM/91/002, "Improving extension services for women", a subcomponent of the WID programme, supported ND control in village chickens using the conventional vaccine, Hitchner B1. Similarly, a Switzerland/UNDP project, GAM/93/004, "Enhancing rural capacities through livestock development", coordinated from Yoro Beri Kunda Veterinary Research Centre, used conventional vaccines (Hitchner B1) and an inactivated vaccine (Pestaviform).

In the United Republic of Tanzania, efforts to control ND in village chickens using the heat-tolerant vaccine were initiated in the Morogoro and Dodoma regions. The activities in Morogoro were coordinated at the Sokoine University of Agriculture, with support from FAO. In the studies in Morogoro, boiled maize, roasted maize, raw rice, raw sorghum and roasted sorghum were the V4 vaccine food carriers tested. Final results from this research are not yet available; however, the interim results showed better protection from the sorghum-based vaccine, while the oral method gave lower protection levels than ocular and drinking-water delivery methods. In the Dodoma region, the field trials, conducted by the Diocese of Central Tanganyika with technical and financial support from ACIAR, reported similar results (Table 10).

In December 1996, a strategy for the control of ND in village chickens in the United Republic of Tanzania using a food-based vaccine was discussed in a workshop financed by ACIAR and attended by

TABLE 10

Trials with vaccines in three villages in the United Republic of Tanzania

Method of vaccination	Serology		Number survived/ number challenged
	GMP*	Protective titre	
Eyedrop	4/1	55/70	8/11
Drinking water	4/1	45/64	8/11
Food	2/3	17/46	3/11
None	0/6	5/56	0/10

Source: Foster, unpublished data.

*Geometric mean titre, log.

*A titre ≥ 3 is accepted as evidence of protection.

scientists from Mozambique. A food-based vaccine specialist from Australia involved in the ND vaccination trials in Southeast Asia also attended. The workshop discussed modalities for introducing the V4 vaccine and I₁, a new seed vaccine containing an avirulent thermostable Australian strain of ND virus, for control of ND in village chickens. The workshop participants were veterinary officers from the zonal veterinary investigation centres, veterinary research officers and poultry extension officers from the Ministry of Agriculture.

The state of ND control in Zimbabwe was different from that found in the other three countries, because ND outbreaks in Zimbabwe were dealt with at national level, while conventional vaccines were being used at village level. The country was reported to be free of the disease until a 1967 outbreak, which was controlled in two years. There were further outbreaks in 1986 and 1994. The last outbreak in 1994 was controlled by mass vaccination. Zimbabwe applied for technical assistance from FAO to cover the expense. The project "Emergency assistance to control Newcastle disease in Zimbabwe", TCP/ZIM/4553, was approved in 1995. The main objectives of the project were to develop a community-based sustainable ND control programme in village chickens based on the heat-stable V4 vaccine.

The progress report produced by the project team gave the preliminary results of the laboratory trials that tested virucidal activity of different food carriers, droppers for dispensing the vaccine in the eyedrop delivery method and water from different sources in the country (Department of Veterinary Services, Zimbabwe, 1997). In the Zimbabwe laboratory trials, feeds tested were pearl millet, sunflower, maize, finger millet (*rapoko*), barley and sorghum. Rice was used as a control. Feeds reported to show good

recovery were pearl millet, sunflower, finger millet and sorghum. Barley gave poor results and crushed and cooked maize gave intermediate results. Field trials were postponed to a second phase because of problems with the potency of the vaccine batch received from a commercial source. This batch has just been replaced and field trials will commence soon.

GENDER ISSUES

Poultry is one of the production systems used to address gender issues in agriculture in the case study countries. The government recognizes the importance of village chickens for women. The two rural poultry improvement programmes, TCP/RAF/2376 and TCP/ETH/4455, both targeted women on the basis of earlier reports on the role of women in village chicken production (Rushton, 1996a, 1996b). Similarly, in the Gambia, project TCP/RAF/2376 targeted women, complemented by the UNDPWID programme. In the United Republic of Tanzania, there were no direct interventions addressing gender issues in village chicken production. However, under the Ministry of Community Development, Women's Affairs and Children, a non-governmental Women's Development Fund was in place to finance poultry activities and promote the formation of women's groups and associations as a means of increasing gender equity.

In Zimbabwe, there were various NGOs supporting women's small-scale enterprises, including rural poultry production with the same goal of empowering women and increasing gender equity. The Ministry of National Employment Creation and Cooperatives runs training centres such as the National Training Centre for Rural Women, where the government and

NGOs run courses on extensive and intensive poultry production. Implementation of the SPFS, which includes a household poultry component and has a major bearing on gender equity, is expected to have an impact on addressing gender issues in rural poultry in these countries.

The ownership pattern of village chickens as a resource can be used to understand gender relations in a production system, as it gives insight into the access to resources of the different genders. In the present study, the individual household interviews in the Gambia show that ownership of village chickens is shared among the different gender categories in the household (Figure 7). A different pattern was observed in the United Republic of Tanzania in the Dodoma region where the responses on ownership patterns of village chickens showed that the chickens are predominantly owned by women and children (Figure 8). Little quantitative data on the ownership patterns of village chickens could be obtained from Ethiopia and Zimbabwe during the field visits.

Division of labour among the different household members is another gender aspect that was studied in the present investigation. The main activities in village chicken production considered in the analysis were shelter construction, feeding, cleaning, watering, the sale of chickens or eggs and disease control and treatment. The study showed that all gender categories are involved in village chicken management (Figures 9 and 10). Construction of shelters was mainly done by men, or by men and children. Group interviews in Ethiopia indicated that management of chickens was fully in the domain of women and children. During the individual interviews it was reported that women manage and prepare nests for laying and brooding,

FIGURE 7
Ownership pattern of village chickens within households in West Division, the Gambia ($n = 45$)

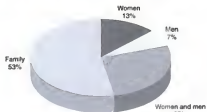


FIGURE 8
Ownership pattern of village chickens in Dodoma, the United Republic of Tanzania ($n = 76$)

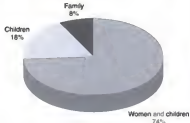
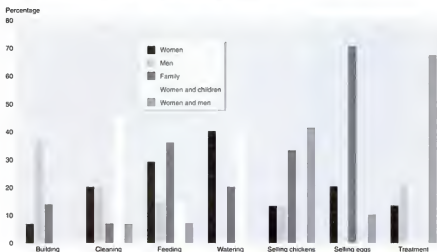


FIGURE 9

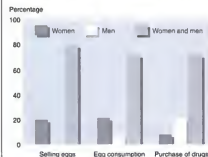
Division of labour among household members in village chicken production in the Gambia

**FIGURE 10**

Increasing meat and egg production from village chickens will result in more equitable distribution of food and income in rural households



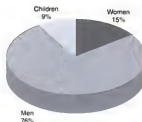
FIGURE 11
Decision-making in village chicken production in the Gambia



especially where fostering of eggs or chicks was practised.

Information on decision-making regarding control of the access to resources was studied by asking questions about which household members decide to sell or dispose of the chickens products. Figure 11 shows the responses obtained from the Gambia, which reflect gender plurality in decision-making in village chickens production. Participation of all

FIGURE 12
Buying and selling of village chickens in village markets in Dodoma, the United Republic of Tanzania ($n = 102$)



categories in selling village chickens was evident in the markets. The market survey in the United Republic of Tanzania shows that men dominated both in selling and buying chickens in village markets (Figure 12).

Implications of the gender issues discussed above in village chicken production improvement programmes and the role of the production system in household economies and gender equity are discussed in Chapter 5.

General discussion

FLOCK CHARACTERISTICS AND PRODUCTION

Results from the present study showed high variability in flock sizes and management practices in village chicken production systems. Although flock sizes in the scavenging production system are described to have less than 50 birds per flock, in this study, the flock size was more than 100 birds per flock. Smaller flock sizes, less than 20 birds per flock, are described for Bangladesh (Bessei, 1990). Rural poultry production systems with flock sizes of over 50 birds per flock are described as semi-intensive production systems, because the flock size requires partial confinement and consequently supplementary feeding (Sonaiya, 1990b). Higher flock sizes in the village chicken production systems in Africa relative to those observed in Asia could be due to the lower population density in African villages. Kuit, Traore and Wilson (1986) noted a close association between flock size and the type of farming system in Mali, where village chicken flock dynamics in three different systems were studied. The data from project TCP/RAF/2376, which had bigger sample size than the present study, shows that the flock sizes in Ethiopia and the Gambia averaged 10 and 12 birds per household, respectively (Rushton, 1996b). In Zimbabwe, partial analysis of the data collected gave an average of 20 birds per household.

Flock sizes can also be described in terms of the flock structure, i.e. the proportion of the different age groups and sex in a flock. This characteristic is used by various scholars to study flock dynamics (Matthewman, 1975; van Veluw, 1987; Wilson *et al.*, 1987; Abdou and Bell, 1992; Buldgen *et al.*, 1992). The proportion of mature hens in the flock is used to estimate egg and chicken production. In the TCP/RAF/2376 project, the village flocks of Ethiopia had on average 3.49 hens, 1.31 cocks, 1.66 growers and 2.87 chicks, whereas those of the Gambia had on average 2.22 hens, 0.68 cocks, 3.18 growers and 3.92 chicks (Rushton, 1996b). Partial analysis of the TCP/ZIM/4553 data showed an average of 3.8 hens, 1.07 cocks, 6.3 growers and 4.8 chicks (Rushton, 1996b). The data obtained from these three countries show that, on average, the hen to cock ratio was three hens to one cock.

Egg production and chick survival are the key

parameters used to study village chicken flock characteristics. The egg production data obtained through hen history in the present study are within the ranges found in the literature (Table 11). However, the chick mortality rates observed in the Gambia are much lower than those reported from other systems (Table 11). Although the clutch size parameter is highly influenced by management, it could also be an indication of the potential for genetic improvement through selection. Analysis of the TCP/RAF/2376 data set by Rushton (1996b) showed different annual egg production levels between the Gambia (23 eggs per hen per year) and Ethiopia (143 eggs per hen per year). The higher egg production levels in Ethiopia reported by Rushton (1996b) were attributed to manipulation of the hen laying cycle, i.e. discouraging brooding. This management practice in Ethiopia could be attributed to a higher return from marketing eggs during the festival period. This practice is unique to Ethiopia compared with the other case study countries. Although demand for chicken products, and specifically chicken meat, is influenced by festivities in most African countries, not much is known of the management practices used in other countries.

Egg production and chick survival data are probably the main determinant of the flock productivity. Chick mortality accounts for high losses in most village chicken production systems. Therefore, management factors that would have a positive impact on chick survival and egg production can be used to increase output from the village chicken flocks.

The egg production parameter in a flock is a function of egg production per hen and the proportion of mature hens in a flock that are laying. Not many field studies have looked into this parameter. However, this is an important parameter for monitoring flock production or studying flock production trends. The TCP/ZIM/4553 data collected show that the proportion of laying hens in a flock was less than 20 percent of the total mature hen population (Figure 13). This parameter can be manipulated through various management practices such as discouraging brooding. Preferential treatment of chicks, which reduces the rearing period, can also increase the proportion of hens in lay, and consequently egg production and bird output.

TABLE 11

Production coefficients of village chickens in developing countries

Reference	Country	Clutches per year	Eggs per clutch	Egg weight	Hatchability (%)	Mature weight (kg)		Mortality	
						Cock	Hen	Chick	Manure
Shanewary and Banerjee (1991)	Ethiopia	—	—	44-49	39-42	—	—	—	1.1-1.7
Bourzat and Saunders (1990)	Burkina Faso	2.7-3.0	12-18	30-40	60-90	—	—	—	—
Minga, Katule, Maeda and Mutasa (1989)	United Republic of Tanzania	—	6-20	41	50-100	1.2	2.2	>80	—
van Veluw (1987)	Ghana	2.5	10	—	72	—	—	50	50
Wilson <i>et al.</i> (1987)	Mali	2.1	8.5	34.4	69.1	1.6	1.02	56	—
Wilson (1979)	Sudan	4.5	10.87	40.6	90	2.1	1.31	—	—

Hatchability is another important parameter in the production characteristics of a village chicken flock. The data obtained in the present study, which ranged from 71 to 78 percent, fall within the range reported in the literature (Table 11). The natural hatching characteristics of village chickens is an attribute that can be used in improving flock productivity. In the Bangladesh semi-scavenging model, local chickens (Dessi) were used to hatch eggs from improved stock as a means of introducing new genetic material (Jensen, 1996).

The importance of the parameters in a village flock can be illustrated in a conceptual model showing expected output of village chicken flocks under two management levels (Table 12). From Table 12, it can be argued that chick losses and egg production are the main determinants of the village chicken flock production systems. The improved management level assumes minimum external input as obtained in Burkina

Faso with ND vaccination and helminth control (Bourzat and Saunders, 1990). The predicted high output of mature chickens reflects the magnitude of the losses resulting from low egg production and bird losses.

PRODUCTION CONSTRAINTS

The literature review in Chapter 2 shows that the low genetic potential of the village chickens was the priority constraint addressed by the early rural poultry improvement programmes. Major research and development efforts concentrated on introducing exotic genes into the local population to increase growth and egg production. However, there have not been major changes in the production levels of village chickens as a result of the cross-breeding programmes. Safalaoh (1997) noted that an indigenous improvement programme that introduced the Black Australop breed showed no impact on the village chicken production systems of Malawi. Rural poultry genetic improvement

FIGURE 13
Hen production characteristics in village chickens in Zimbabwe

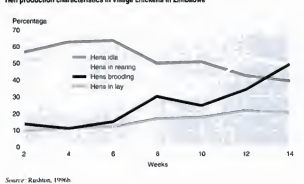


TABLE 12

Production losses in a village chicken flock at two management levels (ten mature hens)

Production characteristic	Traditional management ^a	Improved management ^b
Eggs laid per hen	9-15	15-18
Total number of eggs laid	15-25	75-90
Chicks hatched	9-15	45-54
Chicks raised to six weeks	4-6	31-38
Mature chickens	1.8-2.7	24-30
Estimated harvested eggs	3-5	15-18

^aTraditional management based on production levels observed in the present study. 17% of mature hens in lay, 46% chick mortality and 45% grower mortality.

^bImproved management based on increased proportion of mature hens in lay 50%, reduced chick mortality (30%) and grower mortality (20%).

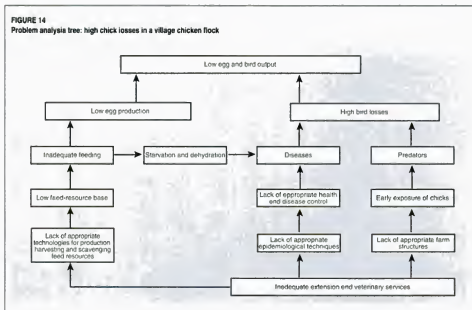
programmes in a number of African countries did not achieve sustainable improvements, and this has been attributed to various factors: operational and financial problems of state-owned farms or stations maintaining the parent stocks, which resulted in failure to deliver the pullets as planned (Minga *et al.*, 1989; Kaiser, 1990); inability to maintain higher management level of improved stock in the villages (Adegbola, 1988); lack of adequate extension support (Kaiser, 1990); and inadequate or poor institutional and organizational support (Kaiser, 1990).

The rural poultry genetic improvement programmes aimed at increasing output per animal. However, recent development-based studies, which involved farmer participation and evaluation of earlier programmes, have shown that raising the management level of the village chickens forms the basis of improvement (Bessei, 1988). In the guidelines for inclusion of household poultry in FAO's SPFS, the following order of priority with a background of technical and management skill development was proposed: Newcastle disease control, feeding systems and management, followed by technical improvement. Figure 14 shows the causal factors of low production in village chicken production systems, based on the farming systems research concept of problem analysis. Figure 15 shows the interactive nature of the different causal factors. Low egg production is a result of inadequate feeding, as well as disease. The problem of low managerial skills features in all production constraints. The interactive nature of village chicken production limits success in single-discipline interventions. From the farmers' perspective, diseases ranked highest among the production constraints.

HEALTH AND DISEASE CONTROL

The problem of diseases in village chickens is compounded by the interactions of different entities

FIGURE 14
Problem analysis tree: high chick losses in a village chicken flock



that are of significant importance to disease epidemiology (Figure 15). At the village level, contacts between flocks of different households, the exchange of birds as gifts or entrusting, sales and purchases are the main sources of infection transmission. Similarly, other domestic fowls and wild birds form another source of infection, because the chickens roam freely in the villages. Pandey (1993), describing the epidemiology and economics of village poultry production in Africa, suggests the need to develop appropriate epidemiological techniques for village poultry, because of the nature of the host-pathogen-environment interaction in village chickens. The complex nature of disease epidemiology in village chickens is found both in epizootic as well as in enzootic diseases (Pandey, Demey and Verhulst, 1993). The high helminth burden in village chicken flocks has been attributed to the scavenging diet that includes some of the hosts such as worms and snails (Pandey, Demey and Verhulst, 1993).

Among the diseases of village chickens, ND was ranked as the most important disease. Table 13 shows the various ND interventions supported by various national and international agencies. There have been no conclusive studies on the most cost-effective vaccine

for control of ND in village chickens. In the Gambia, more than three vaccines had been tested independently, and the interviews held in the present study showed that the farmers did not know the advantages or disadvantages of the different vaccines. In a competitive market, it would be expected that producers will pick the most cost-effective vaccine from the market. However, the village chicken production systems, which are mostly at subsistence level, need policy direction and coordination.

Table 14 shows the cost of ND vaccines in the case study countries. Rushton (1996a) estimated the cost of ND vaccination as 1.28 percent and 19.28 percent of the monthly income derived from an average flock in Ethiopia and the Gambia, respectively. The lower vaccination cost as a proportion of income in Ethiopia is a result of the higher income derived from an average flock in Ethiopia (approximately US\$6) relative to that in the Gambia (approximately US\$1). In Madagascar, in the project TCP/MAG/4555, "Support to rural women's groups in rural poultry development", the cost of ND vaccination was found to be 10 percent of the total cost of a rural poultry farm (E. Gurme-Bleich, personal communication). Ita-New vaccine was used in Madagascar, given as a bivalent of ND and cholera. In the United Republic of Tanzania the cost for 1 000 doses of La Sota vaccine is US\$4.1.

With good organization the vaccination costs are affordable, because the cost of 100 doses of the vaccines is less than that of mature chickens (Table 14). In the United Republic of Tanzania, ten farmers in Ukonga village share the cost of the vaccine and vaccinate their flocks of 30 to 40 birds yearly. Such farmer efforts should be complemented by an operational vaccine quality control system. A national and international intervention would be appropriate in this area.

Table 14 shows that the V4 vaccine is the cheapest among the vaccines in use in these countries. V4 vaccine is more cost effective where oral administration can be used. Although this vaccine could be a future breakthrough for ND vaccination in village chickens, the preliminary results in the case study countries show that there is need for more research and development on various aspects of the handling and administration of the vaccine.

Finally, community participation is required for successful ND vaccination programmes, with a need for a change of attitude and research methodologies to incorporate on-farm research techniques in ND research and control programmes.

FIGURE 15
Village chicken production system: entities of importance in disease epidemiology

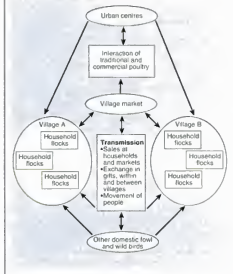


TABLE 13

Agencies working on Newcastle disease control in village chickens in Africa

Agency	Countries	Vaccines	Nature of programme
FAO (projecta TCP/RAF/2376 and TCP/ZIM/4453)	Ethiopia, Gambia, United Republic of Tanzania, Zimbabwe	V4	Technical assistance
FAO (project TCP/MAG/4555)	Madagascar	Ita-New (injectable oily inactivated vaccine)	Poultry development project
Vétérinaires sans frontières	Senegal, Gambia, Burkina Faso, Togo	Pestaxform, HB ₁ , V4	Emphasis on training
Australian Centre for International Agricultural Research (ACIAR)	Mozambique, United Republic of Tanzania, Zambia	V4	Village vaccination trials
Vet Aid	Botswana, Mozambique, Malawi	Lisota (seeking clearance for using V4 and I)	Rural development activity
German Agency for Technical Cooperation (GTZ) through Malawi German Basic Animal Health Service Project	Malawi	V4, Newcavac	Village vaccination trials

TABLE 14

Prices of Newcastle disease vaccines

Country	Vaccine and source	Cost per 100 doses (£/\$)	Cost of 100 doses of vaccine compared with price of mature chicken (%)
Ethiopia	B1 (NVI, Ethiopia)	0.8	0.44
	La Sota (NVI, Ethiopia)	0.8	0.44
	B1 (Solway Animal Health, UK)	0.16	0.08
	V4 (South African Cynamid, SA)	0.34-0.41	0.18-0.23
Gambia	Unspecified (France)	2.7	1.93
	B1 (Solway Animal Health, UK)	0.16	0.11
	V4 (South African Cynamid, SA)	0.34-0.41	0.24-0.29
United Republic of Tanzania	La Sota (source unspecified)	0.41	0.1

Source: Reddon, 1996a.

INTEGRATION OF GENDER CONCERNS IN VILLAGE CHICKEN IMPROVEMENT PROGRAMMES

Project TCP/RAF/2376, "Assistance to rural women in protecting their chicken flocks from Newcastle disease", project TCP/ETH/4455, "Training in rural poultry development" and the present study focus on women. In the Gambia, the UNDP rural development programme also focuses on women. In the literature, there are a number of rural improvement programmes where the poultry component targeted women (Date-Bah, 1985; Bhatti, 1987; Achiemping, 1992; Aboul-Ella, 1992; Ngongi, 1996). The 19th World Poultry Congress (Amsterdam, the Netherlands, 1992) and the 20th World Poultry Congress (New Delhi, India, 1996) had special sessions on women in poultry. The major theme of the African Network for Rural Poultry Development (ANRPD) workshop sponsored by FAO in 1995 was empowering women through smallholder rural poultry production.

In the literature review, several assumptions are

made about the involvement of women in rural poultry projects: helping women to increase rural poultry production increases women's income and thus empowers them; an increase in food production as a result of increased rural poultry production increases equitable distribution of food in the household; village chickens are easily managed within homesteads, and are therefore appropriate development projects for women; women are more resourceful in managing village chickens, and therefore their involvement in development programmes increases production efficiency.

The findings from the present study show that these assumptions cannot be validated simply by targeting women. Ownership of village chickens and access to the benefits are not exclusively the domain of women. A gender component in the projects is required to identify factors of production and access to benefits accrued for development and technology transfer (Paris, 1994).

TABLE 15

Gender-based constraints: needs and opportunities in village chicken production systems

Constraint	Need	Opportunity
Low women's participation in information exchange	Gender sensitization for more women's participation in formal discussions Increased access to information, use of visual aids where there are problems of literacy Training programmes that include women	Complement modern and indigenous technology Raise awareness of potential of village chickens to increase household food security and household economies
Time constraint in chick management during peak labour periods	Introduction of labour-saving technologies Introduction of skills on chick management, e.g. use of locally made crates	Reduce chick losses Reduce women's work drudgery
Low scale of production limiting access to inputs and markets	Introduction of farmers' groups or associations Facilitation of financial services at village level (credit and savings clubs)	Empower women and increase gender equity
Poor marketing system	Improvements in infrastructure and transport services	Increase demand for chicken products and promote production

As Bradley (1996) noted, by excluding poultry production activities from other agricultural production and economic activities, the benefits for women cannot be fully realized. Explicit integration of women's concerns in the production system allows for a broader perspective in analysing needs and opportunities.

Table 15 describes the gender-based constraints in village chicken production needs and possible opportunities. The lack of participation of women in formal meetings, as observed in Ethiopia, could be due to cultural factors or the scheduling of meetings. Alders (1997) pointed out the key issues that have to be considered in order to ensure the participation of women in formal meetings. The choice of the venue of the meeting, the time of day and the duration of the meetings have a bearing on women's participation. An activity calendar could be used to schedule meetings that would allow women to participate. This scheduling gives NGOs an advantage over the governmental institutions in involving women in development activities, because NGOs are flexible in visiting times, while the government institutions follow a rigid schedule.

Apart from the time constraint for women to participate in meetings, women are also challenged because of the nature of their calendar of activities, which reflects the interactive nature of the subsystems of a rural farming system. Labour-saving skills in crop production would allow more time to care for chicks and reduce chick losses, as described by the farmers in the Gambia.

Without the incorporation of gender analysis in village chicken production programmes, there is an

assumption that access to and control of resources and benefits accrued to household members are equal.

Finally, as Alders (1997) observed, involvement of women in rural poultry could have either a negative or a positive impact on gender equity. Involvement of women in rural poultry simply because chickens are small animals or because it is a donor demand does not guarantee a positive impact on gender equity. However, involvement of women on the basis of better use of human resources and accrued benefits would likely lead to a positive impact on gender equity.

INSTITUTIONAL AND ORGANIZATIONAL SUPPORT

A multifaceted approach is required for successful development and the adoption of improvement technologies for village chicken production systems in Africa. Where development assistance to rural poultry is accompanied by strong institutional support, the long-term effects of the assistance are promising. The Bangladesh rural improvement programme "Integration model for the semi-scavenging systems" is cited as a successful programme on rural poultry improvement (Saleque and Mustafa, 1996). The Bangladesh model targeted exclusively landless women and involved these women in the chain of activities of vaccination, hatchery operation, chick rearing and feed selling, as well as in the production of hatching and table eggs for the market. Credit services and marketing aspects also formed part of the model. The success of the Bangladesh model has created interest among those involved in rural development in other developing countries.

In Ethiopia, FAO project TCP/ET/4555 included a component on training for women and group formation

for institutional and organizational support. Success in these activities, especially in group formation, was poor because of the bad experience of farmer groups and associations formed under the former centrally planned state (Swan, 1996). A successful women's group formation programme in Ethiopia was reported by Peacock *et al.* (1994) under a project on goats and women supported by Farm Africa. The lessons from this project that could be used in supporting similar activities in village chicken production systems are: to use the local community to identify the project beneficiaries; to manage the credit system at village level and use payment-in-kind as a means of loan repayment; to use women's veterinary auxiliaries in poultry health programmes; to use simple extension messages; and to emphasize the importance of participatory skills in developing a farmer-researcher-extensionist collaborative working mode.

In the United Republic of Tanzania, rural groups and organizations have been used as the main development strategy for alleviation of poverty and the creation of equitable growth in rural areas. Formal rural cooperatives in the United Republic of Tanzania were introduced during the 1920s. There have been various changes in management of the cooperatives as a result of major government policy changes. Recently, the power of cooperative members has increased and there has been more concern about involving women. In addition, both women's and integrated cooperatives and groups have formed (Msongazila, 1994). According to Meghji (1985), the following lessons can be learned from the United Republic of Tanzania's experiences, particularly in women's involvement in cooperatives and credit schemes:

- any approach taken to provide institutional and organizational support in rural development should aim at breaking the dependency complex;
- too much interference or bureaucracy has a negative impact on cooperatives or organizations;
- gender-biased constraints in cooperative or group formation should be addressed in the process.

Zimbabwe is another country with a long tradition of rural institutional and organizational services. The first rural savings club in Zimbabwe dates back to 1963, although the clubs started as credit unions (Chimedza, 1985). Backyard poultry production under semi-intensive production systems has been undertaken through the support of savings clubs.

Identification of areas in the village chicken production system that require the most institutional

and organizational support would enhance the adoption of methodologies used in other production systems. Input supply and distribution and product utilization are probably the key areas because of the small scale of production involved at the household flock level.

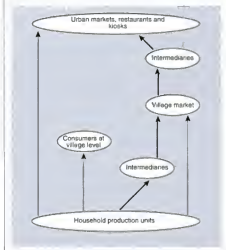
Supply and distribution of veterinary drugs and vaccines is currently the main area that requires institutional and organizational support in village chicken production systems. The poor infrastructure and the small economies of scale do not attract private investment. Supply of veterinary drugs and vaccines requires support because most of the inputs, particularly the vaccines, come in doses higher than the size of the local flocks. Group formation and credit services are therefore required in this area. Local needs, aspirations and skills and cultural, socio-economic and policy issues should be critically analysed in introducing such support services. Experiences from the goats and women project in Ethiopia (Peacock *et al.*, 1994) and those from the People's Participation Programme in Rushinga, Zimbabwe (FAO, 1993) could be tested in the village chicken production system.

Product utilization and marketing is the other key area requiring support. Egg and chicken consumption levels in rural households are low. Results from project TCP/RAF/2376 (Rushton, 1996b) show that average household consumption levels were one chicken and eight eggs per month in Ethiopia. Consumption levels reported in the Gambia from the same project were much lower than those in Ethiopia, with one chicken in two months and a negligible consumption of eggs. The higher rates observed in Ethiopia could result from higher utilization of chicken products in traditional meals. In Ethiopia, traditional meals include egg sauce (*Yenqidal we'Y*), fried chicken (*Yedora t'ibs*) and chicken stew (*Doro we'Y*). *Doro we'Y* uses both eggs and chicken meat and is a popular dish served on special occasions. This could account for the higher consumption rates of both chicken meat and eggs. In Tanzanian towns, the consumption of charcoal-grilled meat (*Nyama choma*), predominantly chicken and goat meat, is increasingly popular. In rural areas in Asia, significant improvements in the production of value-added products, such as chicken meat loaves, gizzard pickles, pickled meat, pickled eggs and chicken nuggets are reported (Sherikar, 1996). Nevertheless, there is still a need, especially in Africa, for vigorous promotion of the consumption of chicken meat, eggs and chicken-derived products among rural communities. Various chicken product preparation

methods, either from traditional dishes or introduced dishes, or use of eggs in producing snack foods could be included in training sessions, particularly where women's groups are involved.

Marketing is another aspect that requires institutional and organizational support. The marketing intervention introduced in the WID project in the Gambia, where specific field days were arranged for women to sell the chickens was welcomed by the farmers. Institutional support offered in marketing could be used to create employment for youths in rural areas. Figure 16 identifies the marketing channels of village chickens in the United Republic of Tanzania. Institutional and organizational support in marketing village chickens would include assistance with feeding, housing and disease control between the different marketing points.

FIGURE 16
Marketing channels of village chickens in central United Republic of Tanzania



Modelling village chicken production systems

Modelling is increasingly accepted as a tool for understanding the complex interactions of the various parts of farming systems, and also as a guide to resource-use decisions for sustainability (Pandey and Hardaker, 1995). However, most of the livestock model structures developed are too complex for smallholder farming systems of Africa like village chicken production systems. Modelling village chicken production systems is complex because of the subsistence nature of the production system, where reliable input-output data are limited. Furthermore, effective use of computer-based models in decision-making in village chicken production systems requires an understanding of the socio-economic aspects of the system, which is an area not adequately addressed in the literature (Kitalyi, 1996). Given these circumstances, computer-based models for village chicken production systems should be simple and flexible.

Johnston and Cumming (1991) describe a simple computerized mathematical representation of a mixed bird population, compartmentalized into subpopulations by age and disease status, which is probably the first attempt to build models for village chickens. The model was termed a "Markov chain model" or state-transitional model and was based on techniques used for other animal production systems. Assigning probabilities to time- and disease-related movements, simulated flock characteristics such as death rates, offtake and composition or structure were drawn, which were similar to those observed in the field. The authors described a model of chicken population and safe yield that showed a decreasing capacity of a population undergoing increasing rates of growth to sustain offtake. In this model, an increasing net population growth rate was described where food supplies were being exploited, with an increasing reproduction rate, which would reach a maximum where the population replenishment and death rates, the food supply and the standing population are all in balance. These models can be used to study the effect of interventions on economic efficiency and resource use.

Modelling village chicken production systems should take into account other factors. The chickens are exposed

to full variability of the environment because they are not confined most of the time; therefore nutrition, reproduction, disease epidemiology and production of the village chickens are influenced by day-to-day conditions. Under these circumstances, the time factor is important in modelling. Interpretation of quantitative longitudinal data should be supported by qualitative data, taking into account seasonal differences. The chickens are not segregated by age or sex, which may increase the volume of data to be collected. Data deficiencies may be apparent in village chicken production systems because of the subsistence nature of the production system.

Village chicken production models can be used to identify key data collection variables; to study features of the production system; to study the relationships among the key variables of the farming system affecting chicken production; to determine responses to interventions; to explore future scenarios (e.g. What are the future effects of effective control of Newcastle disease?); and to support decision-making, particularly in relation to policy and institutional reforms.

In the present study a spreadsheet model initiated by Rushton (1996b) has been used to describe input-output relationships in the village chicken production system.

A SPREADSHEET MODEL FOR VILLAGE CHICKEN PRODUCTION SYSTEMS

Model building blocks

The main parameters of the model, calculations and output worksheet are based on the factors described in Figure 17. The first building block constitutes the main parameter worksheet and contains the initial flock data. This block accounts for sex and age factors, where the age is set following the life cycle of village chickens. The egg data cover three weeks, and harvested eggs (sales or consumption) are taken at week 1. All eggs transferred to weeks 2 and 3 are assumed to be in incubation and will hatch in 21 days. Chick data cover week 4 to week 8, when the chicks are transferred to the growers group. The growers include males and females, in a 50:50 ratio. The growing period is estimated to last until week 24, when all the growers are transferred to the hens and cocks group.

The other input parameters are hen data, flock losses and flock offtake. The hen data set contains hen production coefficients: the percentage of hens laying eggs, the number of eggs laid per day, the percentage of eggs eaten or sold and the percentage of eggs incubated in the hatch. The losses data set contains data on all losses, either through predators, death or theft. The offtake data set includes eggs and birds sold or consumed.

The first building blocks are used to calculate the flock numbers and weekly totals, and then are used to compute the flock output. At this stage, another input data set that can contain input requirements or costs can be added to study the input-output relationships.

Calculations

In the flock number building block, the population of each category was calculated for each week (Wn) using the following formula:

$$\begin{aligned} (E0_{Wn} &= MH_{W(n-1)} + pMH\text{-inlay} + \text{eggs laid per day}) - \\ & (MH_{W(n-1)} + pMH\text{-inlay} + \text{eggs laid per day} = \text{egg-} \\ & \text{offtake}), \end{aligned}$$

where

$E0_{Wn}$ = total number of week 1 eggs (week is based on life cycle of the chickens) at any week in period (n),

i.e. time of data collection, assumed to cover week 1 to week 48;

$MH_{W(n-1)}$ = total number of mature hens in the previous week;

$pMH\text{-inlay}$ = proportion of mature hens in lay, calculated on monthly basis.

The same formula was used to calculate the other categories. However, at the transition period, i.e. transfers from one category to another (egg to chicks, chicks to growers and growers to replacement stock), calculations were made so that the replacements were included:

$$\text{Chick } 4_{Wn} = E2_{W(n-1)} + (MH_{W(n-1)} + pMH\text{-inlay} + \text{eggs laid per day} + pE\text{ggs incubated in that hatch});$$

$$\text{Grower } 9_{Wn} = C7_{W(n-1)} - (C7_{W(n-1)} + pC7\text{-losses}_{W(n-1)}) + (C7_{W(n-1)} + pC7\text{-offtake}_{W(n-1)});$$

$$MH_{Wn} = MH_{W(n-1)} - (MH_{W(n-1)} + pMH\text{-losses}_{W(n-1)}) - (MH_{W(n-1)} + pMH\text{-offtake}_{W(n-1)}) + FG23 - (FG23 + FG23\text{-offtake}_{W(n-1)});$$

where

FG = fully grown.

Annexes 9 and 10 show a sample page of the initial flock and the flock number worksheet. Using the summation function, weekly data were drawn for each flock category. The weekly worksheet was then used to

FIGURE 17

Conceptual structure of a computer-based model for village chicken production systems

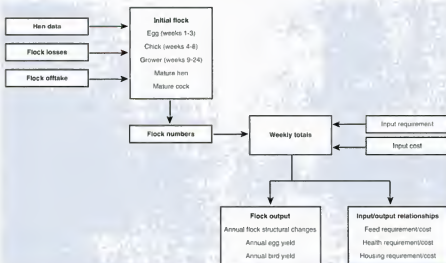


FIGURE 18
Flock structure of chicks and growers

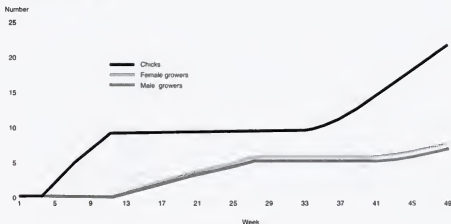
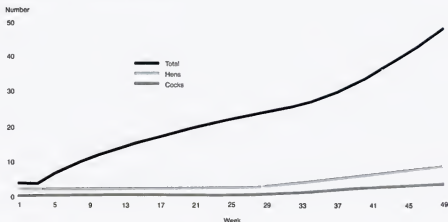


FIGURE 19
Flock structure of hens, cocks and total bird population

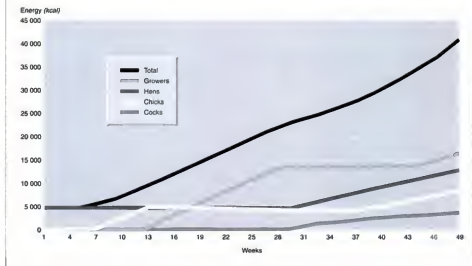


draw flock output, which can be used to study the flock structure changes (Figures 18 and 19). As indicated above, the data on input requirements or costs can be added to the model (Figure 20). Setting the data input parameters at different levels as a result of improvement interventions, the model can be used to predict input requirements and relate them to available resources.

This model can be used as a planning tool. Input parameters can be manipulated to fit planned interventions or expected output, and their effect on flock input-output can be predicted using the model.

Data sets collected in village poultry surveys can be used to validate the model. In the present study, there were no adequate data to test the model. There is a need

FIGURE 20
Energy requirement for different flock categories



for more farm-based research on appropriate data collection techniques. Key questions are: What are the critical production indicators? By whom and how should data be collected? What are the appropriate data management techniques?

This simple model is based on data that can be collected directly from the field. It will facilitate data management as data can be stored directly in the spreadsheet. The model can be used in studying flock dynamics and in planning village chicken improvement technologies.

Conclusions and recommendations

Village chicken production systems have not been included in the mainstream agricultural and economic activities of most African countries. There is a paucity of quantitative data to support the importance of the village chicken production systems in household and national economies. There has been more development focused on introducing exotic high-yielding breeds than understanding the production potential of village chickens. Nevertheless, a new research focus on village chickens has developed in the last decade, and consequently there have been changes in objectives and development strategies.

Village chicken production systems are integrated in the rural farming systems, and therefore sustainable improvement programmes need to adopt a systems perspective. Achievements made in single-discipline-oriented programmes are not sustainable, as noted in the past improvement programmes. The FAO technical assistance programmes, as well as development programmes, have made a major impact – particularly in increasing awareness on the importance of this sector in household food security and welfare. However, these programmes were short term, and in most cases the local governments and beneficiary communities are not prepared to sustain the developments. The Newcastle disease vaccination programmes conducted in the case study countries give examples of this problem of continuity. Therefore, there is a need to develop a cross-checking mechanism within the technical assistance programmes that will ensure the continuity of activities to develop sustainable improvements. The inclusion of a household poultry element in FAO's SPFS creates an opportunity for technical assistance programmes for rural poultry. Furthermore, the multidisciplinary nature of the SPFS will allow for sharing and exchange of experiences among different divisions of FAO.

This study was based on the hypothesis that village chicken production systems of Africa form the basis for improved rural poultry and can be transformed from subsistence to semi-commercial production systems to increase food security and income, specifically among the disadvantaged members of

the community. First, the predominance of local chickens in most countries, after more than five decades of introducing exotic genes, supports this hypothesis. The analytical presentation of the problem of low production of village chicken flocks (Figure 14) shows that substantial increases in egg production and chicken meat production can be attained through improved management and disease control to reduce the large number of bird losses. The experience of the rural poultry improvement programme in the Gambia and the semi-scavenging model for rural poultry in Bangladesh indicate that with an appropriate approach and technology, rural poultry can be transformed from a subsistence to a semi-commercial production system.

In view of the complex nature of the village chicken production systems, improvement technologies should be introduced using the farming systems approach. Step-wise improvements, suggested in the guidelines for inclusion of household poultry in the SPFS, provide the most integrated approach and should be vigorously pursued by both FAO and member countries. Four steps are suggested in Figure 21 to transform the village chicken production systems into semi-commercial production units.

The village chicken production systems are not homogenous; thus step 1 may not be the starting-point for every village or country. However, Newcastle disease, which is the major constraint identified by farmers, should be given priority at all stages. The following strategic measures for developing sustainable community-based ND control in village chickens are drawn from the present study.

- **Country epidemiological studies.** More country epidemiological studies in village chickens should be undertaken to understand the host-pathogen-environment interactions. Results from such studies could be used in developing vaccination programmes, as well as selecting the most cost-effective vaccines.
- **ND vaccine production and quality control.** There is a need for more coordinated research on the most appropriate and cost-effective vaccine for controlling ND in village chickens. The role of

the Pan African Veterinary Vaccine Centre (PANVAC) in the harmonizing of ND and quality control need to be reviewed. The production of ND vaccines, particularly the heat-stable V4 vaccine, is not likely to be undertaken by national systems in the near future. Therefore, there is need for more national and international support on possible future production of the vaccine. PANVAC reopened in 1996, and should be supported to enable the centre to conduct independent quality control of the different vaccines used in the region.

- **Community-based ND control programmes.** Community participation in ND control programmes is crucial to the development of sustainable control programmes. Farmer training using extension messages through the media, i.e. television, radio, newspapers and posters, should be part of ND control programmes, as is commonly practised in programmes for rinderpest eradication, contagious bovine pleuropneumonia, foot-and-mouth disease and rabies.

- **Networking.** Networking should be encouraged in village chicken production. There is a need for more national support to the existing African Network for Rural Poultry Development (ANRPD). The network should endeavour to identify key or priority problems that would benefit from networking. Regional networks to control ND, similar to those of Southeast Asia, should be started and linked with the ANRPD. The FAO/International Fund for Agricultural Development (IFAD) Regional Animal Disease Surveillance and Control Network for North Africa, the Near East and the Arabian Peninsula (RADISCON) has been launched (see <http://www.fao.org/WAICENT/FaoInfo/Agricult/AGA/AGAH/Radiscon/Default.htm>).

- **Production, feeding and harvesting of unconventional feed resources.** Techniques for producing, harvesting and feeding of unconventional feed resources that have been tested on a small scale should be developed further to increase the scavenging feed resource base. Integrating chickens with cropping or gardening should be encouraged where conditions allow.

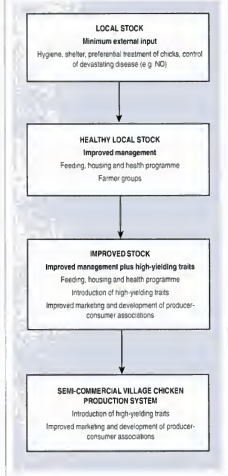
- **Farm structures.** Appropriate farm structures, including housing, feeders, waterers, nests and cages for transportation should be developed. Designs that can be used to provide preferential

treatment, such as feeding and vaccination, to birds of different ages should be encouraged.

In conclusion, the proposed development approaches and improvement technologies should be based on producer participation, particularly aimed at increasing management skills, product utilization and marketing. Incorporation of a gender variable in all rural poultry improvement programmes will increase resource-use efficiency and equal distribution of the benefits.

FIGURE 21

Step-wise improvement of the village chicken production systems



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Annexes

International poultry periodicals

Title	Corporate author/editor	Publication type/series
<i>African Network for Rural Poultry Development (ANRPD) Newsletter</i>	African Network for Rural Poultry Development	News, research reports and development issues. Series beginning in 1992
<i>American Poultry Association Online</i>	American Poultry Association	Articles on purebred poultry for hobby and exhibition
<i>Avian Disease</i>	American Association of Avian Pathology	Poultry disease, published monthly
<i>Avian Diseases</i>	Indian Veterinary Research Institute	Poultry disease, published annually
<i>British Poultry Science</i>	Poultry Education Association, UK	Academic and scholarly articles
<i>Indian Journal of Poultry Science</i>	Indian Poultry Science Association	Academic and scholarly publication, quarterly
<i>Indian Poultry Review</i>	Indian Poultry Lovers Association	Semimonthly publication
<i>International Hatchery</i>	Positive Action Publication, UK	Trade publication
<i>Japanese Poultry Science</i>	Japan Poultry Association	Quarterly publication on poultry science, abstracts in English
<i>Missal World Poultry</i>	Union of Poultry, the Netherlands	Bimonthly
<i>Poultry and Avian Biology Reviews (formerly Poultry Science Reviews)</i>	Science and Technology Letters	Academic and scholarly publication
<i>Poultry and Egg Marketing</i>	Poultry and Egg News, USA	Bimonthly news for poultry marketing
<i>Poultry Bulletin South Africa</i>	South African Poultry Association	Poultry bulletin, monthly, language Afrikaans
<i>Poultry Forum</i>	National Farmers Union, UK	Trade publication
<i>Poultry Guide</i>	C.P. Narang, India	Trade publication and technical information for poultry farmers
<i>Poultry International</i>	Watt Publishing Company, USA	Trade publication, monthly. International commercial focus on production, processing and marketing of eggs, broilers and turkeys
<i>Poultry Middle East and North Africa</i>	Middle East Agriculture, Lebanon	Trade publication
<i>Poultry Science</i>	Poultry Science Association, USA	Academic and scholarly publication, monthly
<i>World Poultry Science Journal</i>	World Poultry Science Association	Scholarly, academic and developmental publication

Annex 2

Working missions

Country	Period	Contact institutions	Key informants
Ethiopia	11-17 August 1996	FAO Representative	V. Paily, PANVAC
		PANVAC	M. Yarn, PANVAC
		Debre Zeit Agricultural Research Centre	G. Mebratu, National Veterinary Research Institute
			T. Dessie, Debre Zeit Agricultural Research Centre
			B. Legesse, East Shoa Woreda Office
			M. Adem, East Shoa Woreda Office
Gambia	18-29 August 1996	FAO Representative	O. Touray, Department of Livestock Services
		Department of Livestock Services	A. Njie, Department of Livestock Services
		Department of Planning	L. Thorp, UNDP Office, Banjul
		UNDP	B. Bantoh, Yoro Ben Kunda Veterinary Centre
			A. Short, Yoro Ben Kunda Veterinary Centre
			Y. Jalo, Department of Planning
United Republic of Tanzania	12 December 1995 - 9 January 1996	FAO Representative	U. Minga, Sokoine University of Agriculture, Morogoro
		Ministry of Agriculture	M. Yongolo, Sokoine University of Agriculture, Morogoro
	9 July - 4 August 1996	Department of Livestock Services and Animal Disease Research Institute	A. Parmin, The Royal Veterinary and Agricultural University, Denmark
	27 November - 15 December 1996	Veterinary Investigation Centre, Mtwapa	J. I. Kituly, Officer-in-Charge, Veterinary Investigation Centre, Mtwapa
		Sokoine University of Agriculture	A. Foster, Technical Adviser, Diocese of Central Tanganyika
		Ministry of Community Development, Women's Affairs and Children	Dr. Malewas, Ministry of Agriculture
			K. J. Boku, Ministry of Agriculture
			E. Shekwa, Ministry of Community Development, Women's Affairs and Children
			E. Zeyumba, Ministry of Community Development, Women's Affairs and Children
Zimbabwe	1 April - 9 July 1996	FAO Subregional Office for Southern and East Africa	Dr. Hargreaves, Director, Department of Veterinary Services, Ministry of Agriculture
		Ministry of Agriculture, Department of Veterinary Services	Dr. Madzima, Deputy Director, Department of Veterinary Services, Ministry of Agriculture
	18 October - 26 November 1996	FARMESA (FAO/Swedish International Development Cooperation Agency (SIDA) programme)	L. Lambrou, Poultry Advisor, Ministry of Agriculture
	22 January - 26 February 1997	National Training Centre for Rural Women	M. Mavengwa, National Coordinator
			TCP/ZIM/4553, Central Veterinary Laboratory, Ministry of Agriculture
			F. Chitide, Veterinary Epidemiology Unit, Ministry of Agriculture

Sample questionnaire for data collection on intrahousehold dynamics

Enumerator
Country
Region/province
Village
Household
Date

	Women	Men	Children	Family
Ownership				
Labour profile				
Shelter construction				
Cleaning chicken house				
Supplementary feeding				
Providing water				
Selling chicken				
Selling eggs				
Treatment				
Decision making				
Selling eggs				
Selling chicken				
Home consumption of eggs				
Home consumption of chicken				
Purchase of drugs				

Annex 4

Sample questionnaire for collection of hen production data on the basis of hen history

Mature hen	No. of eggs laid per clutch	No. of eggs incubated	No. of chicks hatched	No. of eggs wasted	No. of chicks weaned
Hen 1					
Hen 2					
Hen 3					

Annex 5

Sample questionnaire for market survey on village chickens

Enumerator
Country
Region/province
Village
Household
Date

	Demand				Supply			
	Chickens		Eggs		Chickens		Eggs	
	Low	High	Low	High	Low	High	Low	High
Time of year								
Price								
Main chicken category (mature cocks, mature hens, growers)								
Main delivery system (household, village market, urban market)								
Main seller category (men, women, children)								
Remarks								

Annex 6

Sample questionnaire for longitudinal data collection for village chicken production systems

Enumerator
Village
Household
Date of Visit A
Date of Visit B

	Chicks	Growers	Hens	Cocks
Previous recording				
Sold	-	-	-	-
Gifted	-	-	-	-
Consumed	-	-	-	-
Died	-	-	-	-
Lost	-	-	-	-
Transferred out ^a	-	-	-	-
Purchased	+	+	+	+
Entrusted	+	+	+	+
Transferred in ^b	+	+	+	+
Number at Visit A				
Observed	Check			
Sold	-	-	-	-
Gifted	-	-	-	-
Consumed	-	-	-	-
Died	-	-	-	-
Lost	-	-	-	-
Transferred out ^a	-	-	-	-
Purchased	+	+	+	+
Entrusted	+	+	+	+
Transferred in ^b	+	+	+	+
Number at Visit B				
Observed	Check			

^aMoved from one age category to another, i.e. chicks become growers once they are independent of their mother.

^bMoved from the previous age category, which for chicks is hatched eggs.

Record the number of hens that laid eggs since the previous visit. Also record the number of hens that are currently sitting on eggs and looking after chicks.

	Hens in lay	Hens sitting on eggs	Hens looking after chicks	Idle hens
Visit A				
Visit B				

Observe the number of eggs in nests and the number of eggs being incubated. Check the number of eggs sold, eaten, hatched and wasted since the last visit.

	Eggs in nests	Eggs being incubated
Previous visit		
Consumed	-	
Sold	-	
Hatched		+
Wasted		-
Laid	+	
Begun incubation	-	+
Number at Visit A		
Consumed	-	
Sold	-	
Hatched		+
Wasted		-
Laid	+	
Begun incubation	-	+
Number at Visit B		

Record feed inputs purchased since the last visit.

	Type	Quantity	Price
Visit A			
Visit B			

Record the veterinary medicine and other inputs for poultry since the last visit.

	Veterinary medicine purchased			Other inputs purchased		
	Type	Quantity	Price	Type	Quantity	Price
Visit A						
Visit B						

Sample questionnaire for collection of cross-sectional data on village chicken production systems

Single visit data

HOUSING

1. Where do the chickens rest at night?
 - a) Do not know
 - b) Kitchen/store
 - c) In the main house
 - d) Perch on trees
 - e) Woven basket
 - f) Other (specify)
2. Who constructed the chicken house/shelter?
 - a) Adult male
 - b) Adult female
 - c) Young boys
 - d) Young girls
3. Do you clean the chicken house? Yes/No
4. If yes, how frequently do you clean the chicken house?
 - a) Daily
 - b) Weekly
 - c) Monthly
 - d) Less than once per month
5. Who cleans the house?
 - a) Adult male (>18 years)
 - b) Adult female (>18 years)
 - c) Boys (<18 years)
 - d) Girls (<18 years)
 - e) Hired labour

SUPPLEMENTARY FEEDING (OTHER THAN SCAVENGED FEED)

1. Describe the supplement in the following chart.

Type of supplement	Source (household harvest, purchase, donation)	If purchased, unit price	Quantity and time of feeding per day	Person who feeds the chickens

2. Do you provide water to the chicken? Yes/No

If yes, fill in the following table.

Source of water (tap, river, bore hole, well)	Type of drinkers	How frequently do you provide water?	How far is the source of water from the homestead?	What is the walking distance to the water source?

3. Where do you sell most of the chicken products in the village?

- In the same village
- In neighbouring villages
- In nearest shopping centre
- In town

ANIMAL HEALTH (DETAILED INFORMATION TO BE OBTAINED FROM THE SEROSURVEYS)

Information to be collected monthly

1. Have you experienced any disease problems in your flock this month? Yes/No

If yes, indicate the symptoms/disease and control measures taken using the chart below. Rank the problems in order of importance.

Type of disease/ symptoms	Control measure	Cost incurred to control	Last occurrence in the flock	Age group affected	Rank according to importance
Swollen head					
Swollen joints					
Coughing					
Diarrhoea (bloody/greenish)					
Twisted neck					
Paralysed legs/wings					
Fowl pox/warts					
Newcastle disease					
Mites/ticks					
Fleas					

2. Do you have access to veterinary services? Yes/No

If yes, please fill in the chart below.

Source/name of centre	Type of service (advice, diagnosis, drugs)	Cost incurred, if any	Frequency of visits by veterinary assistants

3. In which season do you lose most of your chickens?
 - a) Rainy season
 - b) Dry season
 - c) Both seasons
4. Have you heard of Newcastle disease? Yes/No
If yes, where and when?
5. Has there been any occurrence of Newcastle disease in your flock? Yes/No
6. If yes, can you describe the symptoms?
7. When did Newcastle disease last occur in your flock?
8. How did it affect your flock?
 - a) Wiped out the whole flock
 - b) Destroyed more than half of the flock
 - c) Destroyed less than half the flock
 - d) No mortality
9. What treatment did you give your chickens to control the Newcastle disease?

Treatment	Type of drug	Source of drug	Cost incurred

10. What was the source of infection?
 - a) Own flock
 - b) Incoming chicken
 - c) Neighbouring household
 - d) Neighbouring village
 - e) Unknown
11. What do you think is the best control strategy for Newcastle disease?

Guidelines for collecting data on village chicken production systems using participatory rapid appraisal techniques

FLOCK OWNERSHIP PATTERN AND MANAGEMENT AT HOUSEHOLD LEVEL

1. Who owns the chickens in the household?

- a) Adult male (>18 years)
- b) Adult female (>18 years)
- c) Boys (<18 years)
- d) Girls (<18 years)
- e) Collective household ownership

2. What are the main activities in looking after the chickens?

Activity	Responsible member of household

3. What are the uses and functions of chicken and chicken products?

Produce	Function	Priority	Household member with access	Household member with control
Eggs				
Home food				
Sell				
Gift				
Other				
Chickens				
Home food				
Sell				
Gift				
Other				

4. How do you use the chicken manure?
5. How do you rank the functions of chicken in the village?
 - a) Source of food
 - b) Source of income
 - c) Social functions (ceremonies, gifts, rituals)

INTERHOUSEHOLD LEVEL: MOVEMENT AND EXCHANGE OF CHICKEN AND CHICKEN PRODUCTS BETWEEN HOUSEHOLDS

To be collected in village transect walk in predetermined seasons

1. What is the average distance between households (km)?
2. Do the flocks of birds from one household mix with other flocks? Yes/No
3. What are the main methods of exchanging chicken products?
 - a) Sell/buy
 - b) Gifts
 - c) Food/feast
 - d) Barter
4. Where do you sell most of the chicken products of the village?
 - a) In the same village
 - b) In neighbouring villages
 - c) In nearest shopping centre
 - d) In town
5. What are the available scavenging feed resources in the homestead vicinity?

Season	Type of feed resource	Availability (abundant, moderate, rare)	Nutritional value ^a

^aNutritional value established in literature or determined in the laboratory.

VILLAGE-LEVEL INSTITUTIONAL FACTORS AND HOUSEHOLD INTERRELATIONSHIPS

To be collected from key informants

1. What is the distance to nearest neighbouring village (km)?
2. What is the distance to nearest market (km)?
3. What is the distance to nearest town centre (km)?
4. What is the distance to nearest good road (km)?
5. What is the distance to nearest animal health or veterinary office (km)?
6. Are there farmers' associations or clubs operating in the village? Yes/No
If yes, please describe.

Name of association	Date of formation	No. of members		Main activities
		Male	Female	

7. Does the village have access to formal or informal (e.g. Chimbado) credit schemes? Yes/No
If yes, describe the scheme.

Name of scheme	Date of formation	No. of members with access

Annex 9

Project documents for TCP/RAF/2376

**"Assistance to rural women in protecting their chicken flocks
from Newcastle disease"**

Type of report	Author/consultant	Reporting period
Project write-up	FAO	July 1993
Field-based Newcastle disease vaccine specialist, consultancy report	P.B. Spradbrow	December 1993
Socio-economics, consultancy report	J. Rushton	December 1993
Laboratory vaccine trials	M. Yarns	November 1995
Rural extension, international consultant	S. Swan	September 1995
Terminal report	V.J. Palya	1995

FAO ANIMAL PRODUCTION AND HEALTH PAPERS

1	Animal breeding: selected articles from the <i>World Animal Review</i> , 1977 (C E F S)	39	Solar energy in small-scale milk collection and processing, 1983 (E F)
2	Eradication of hog cholera and African swine fever, 1976 (E F S)	40	Intensive sheep production in the Near East, 1983 (Ar E)
3	Insecticides and application equipment for tsetse control, 1977 (E F)	41	Integrating crops and livestock in West Africa, 1983 (E F)
4	New faed resources, 1977 (E/F/S)	42	Animal energy in agriculture in Africa and Asia, 1984 (E/F S)
5	Bibliography of the crollio cattle of the Americas, 1977 (E/S)	43	Olive by-products for animal feed, 1985 (Ar E F S)
6	Mediterranean cattle and sheep in crossbreeding, 1977 (E F)	44/1	Animal genetic resources conservation by management, data banks and training, 1984 (E)
7	The environmental impact of tsetse control operations, 1977 (E F)	44/2	Animal genetic resources: cryogenic storage of gamplasm and molecular engineering, 1984 (E)
7 Rev. 1	The environmental impact of tsetse control operations, 1980 (E F)	45	Maintenance systems for the dairy plant, 1984 (E)
8	Declining breeds of Mediterranean sheep, 1978 (E F)	46	Livestock breeds of China, 1984 (E F S)
9	Slaughterhouse and slaughterlab design and construction, 1978 (E F S)	47	Réintégration du lait à la ferme et organisation des transports, 1985 (F)
10	Treating straw for animal feeding, 1978 (C E F S)	48	La fromagerie et les variétés de fromages du bassin méditerranéen, 1985 (F)
11	Packaging, storage and distribution of processed milk, 1978 (E)	49	Manual for the slaughter of small ruminants in developing countries, 1985 (E)
12	Ruminant nutrition: selected articles from the <i>World Animal Review</i> , 1978 (C E F S)	50	Better utilization of crop residues and by-products in animal feeding: research guidelines - 1. State of knowledge, 1985 (E)
13	Buffalo reproduction and artificial insemination, 1979 (E*)	50/2	Better utilization of crop residues and by-products in animal feeding: research guidelines - 2. A practical manual for research workers, 1986 (E)
14	The African trypanosomiasis, 1979 (E F)	51	Dried salted meats: charque and carne-de-sol, 1985 (E)
15	Establishment of dairy training centres, 1979 (E)	52	Small-scale sausage production, 1985 (E)
16	Open yard housing for young cattle, 1981 (Ar E F S)	53	Slaughterhouse cleaning and sanitation, 1985 (E)
17	Prolific tropical sheep, 1980 (E F S)	54	Small ruminants in the Near East - Vol. I. Selected papers presented for the Expert Consultation on Small Ruminant Research and Development in the Near East (Tunis, 1985), 1987 (E)
18	Faied from animal wastes: state of knowledge, 1980 (C E)	55	Small ruminants in the Near East - Vol. II. Selected articles from <i>World Animal Review</i> 1972-1988, 1987 (Ar E)
19	East Coast fever and related tick-borne diseases, 1980 (E)	56	Sheep and goats in Pakistan, 1985 (E)
20/1	Trypanotolerant livestock in West and Central Africa - Vol. 1. General study, 1980 (E F)	57	The Awassi sheep with special reference to the improved dairy type, 1985 (E)
20/2	Trypanotolerant livestock in West and Central Africa - Vol. 2. Country studies, 1980 (E F)	58	Small ruminant production in the developing countries, 1986 (E)
20/3	La bétail trypanotolérant en Afrique occidentale et centrale - Vol. 3. Bilan d'une décennie, 1988 (F)	59/1	Animal genetic resources data banks - 1. Computer systems study for regional data banks, 1986 (E)
21	Guideline for dairy accounting, 1980 (E)	59/2	Animal genetic resources data banks - 2. Descriptor lists for cattle, buffalo, pigs, sheep and goats, 1986 (E F S)
22	Recursos genéticos animales en América Latina, 1981 (S)	59/3	Animal genetic resources data banks - 3. Descriptor lists for poultry, 1986 (E F S)
23	Disease control in semen and embryos, 1981 (C E F S)	60	Sheep and goats in Turkey, 1986 (E)
24	Animal genetic resources - conservation and management, 1981 (C E)	61	The Przewalski horse and restoration to its natural habitat in Mongolia, 1986 (E)
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26	Carnals and camel milk, 1982 (E)	63	Proceedings of the FAO expert consultation on the substitution of imported concentrate feeds in animal production systems in developing countries, 1987 (C E)
27	Deer farming, 1982 (E)	64	Poultry management and diseases in the Near East, 1987 (Ar)
28	Faied from animal wastes: feeding manual, 1982 (C E)	65	Animal genetic resources of the USSR, 1989 (E)
29	Echinococcosis/hydatidosis surveillance, prevention and control: FAO/UNEP/WHO guidelines, 1982 (E)	66	Animal genetic resources - strategies for improved use and conservation, 1987 (E)
30	Sheep and goat breeds of India, 1982 (E)	67/1	Trypanotolerant cattle and livestock development in West and Central Africa - Vol. I, 1987 (E)
31	Hormones in animal production, 1982 (E)	67/2	Trypanotolerant cattle and livestock development in West and Central Africa - Vol. II, 1987 (E)
32	Crop residues and agro-industrial by-products in animal feeding, 1982 (E/F)		
33	Haemorrhagic septicaemia, 1982 (E F)		
34	Breeding plans for ruminant livestock in the tropics, 1982 (E F S)		
35	Off-tastes in raw and reconstituted milk, 1983 (Ar E F S)		
36	Ticks and tick-borne diseases: selected articles from the <i>World Animal Review</i> , 1983 (E F S)		
37	African animal trypanosomiasis: selected articles from the <i>World Animal Review</i> , 1983 (E F)		
38	Diagnosis and vaccination for the control of brucellosis in the Near East, 1982 (Ar E)		

68	Crossbreeding <i>Bos indicus</i> and <i>Bos taurus</i> for milk production in the tropics, 1987 (E)	102	Legume trees and other fodder trees as protein sources for livestock, 1992 (E)
69	Village milk processing, 1988 (E F S)	103	Improving sheep reproduction in the Near East, 1992 (Ar)
70	Sheep and goat meat production in the humid tropics of West Africa, 1989 (E/F)	104	The management of global animal genetic resources, 1992 (E)
71	The development of village-based sheep production in West Africa, 1988 (Ar E F S) (Published as Training manual for extension workers, M/55840E)	105	Sustainable livestock production in the mountain agro-ecosystem of Nepal, 1992 (E)
72	Sugarcane as feed, 1988 (E/S)	106	Sustainable animal production from small farm systems in South-East Asia, 1993 (E)
73	Standard design for small-scale modular slaughterhouses, 1988 (E)	107	Strategies for sustainable animal agriculture in developing countries, 1993 (E F)
74	Small ruminants in the Near East – Vol. III. North Africa, 1989 (E)	108	Evaluation of breeds and crosses of domestic animals, 1993 (E)
75	The eradication of ticks, 1989 (E/S)	109	Bovine spongiform encephalopathy, 1993 (Ar E)
76	<i>Ex situ</i> cryoconservation of genomes and genes of endangered cattle breeds by means of modern biotechnological methods, 1989 (E)	110	L'amélioration génétique des bovins en Afrique de l'Ouest, 1993 (F)
77	Training manual for embryo transfer in cattle, 1991 (E)	111	L'utilización sostenible de hembras F1 en la producción del ganado lechero tropical, 1993 (S)
78	Milking, milk production hygiene and udder health, 1989 (E)	112	Physiologie de la reproduction des bovins trypanotolérants, 1993 (F)
79	Manual of simple methods of meat preservation, 1990 (E)	113	La technologie des fromages au lait de dromadaire (<i>Camelus dromedarius</i>), 1993 (F)
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84	Training manual for embryo transfer in water buffaloes, 1991 (E)	118	Quality control testing of rinderpest cell culture vaccine, 1994 (E)
85	The technology of traditional milk products in developing countries, 1990 (E)	119	Manual on meat inspection for developing countries, 1994 (E)
86	Feeding dairy cows in the tropics, 1991 (E)	120	Manual para la instalación del pequeño matadero modular de la FAO, 1994 (S)
87	Manual for the production of anthrax and blackleg vaccines, 1991 (E F)	121	A systematic approach to tsetse and trypanosomiasis control, 1994 (E/F)
88	Small ruminant production and the small ruminant genetic resource in tropical Africa, 1991 (E)	122	El capibara (<i>Hydrochoerus hydrochaeris</i>) – Estado actual de su producción, 1994 (S)
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91	Guidelines for slaughtering, meat cutting and further processing, 1991 (E F)	125	Veterinary education, 1995 (E)
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93	Utilization of renewable energy sources and energy-saving technologies by small-scale milk plants and collection centres, 1992 (E)	127	World livestock production systems – Current status, issues and trends, 1996 (E)
94	Proceedings of the FAO expert consultation on the genetic aspects of trypanotolerance, 1992 (E)	128	Quality control testing of contagious bovine pleuropneumonia live attenuated vaccine – Standard operating procedures, 1996 (E F)
95	Roots, tubers, plantains and bananas in animal feeding, 1992 (E)	129	The world without rinderpest, 1996 (E)
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98	Small-scale poultry processing, 1992 (Ar E)	132	Feeding pigs in the tropics, 1997 (E)
99	<i>In situ</i> conservation of livestock and poultry, 1992 (E)	133	Prevention and control of transboundary animal diseases, 1997 (E)
100	Programme for the control of African animal trypanosomiasis and related development, 1992 (E)	134	Tratamiento y utilización de residuos de origen animal, pesquero y alimenticio en la alimentación animal, 1997 (S)
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		136	Proceedings of the first Internet Conference on Salmalian Trypanosomes, 1997 (E)
		137	Developing national emergency prevention systems for transboundary animal diseases, 1997 (E)
		138	Producción de cuyes (<i>Cavia porcellus</i>), 1997 (S)

- 139 Tree folage in ruminant nutrition, 1997 (E)
 140/1 Analisis de sistemas de producción animal – Tomo 1:
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 142 Village chicken production systems in rural Africa –
 Household food security and gender issues, 1998 (E)

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Ar	-	Arabic	Multi	-	Multilingual
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This publication presents the results of a field study on village chicken production and health and an analysis of their importance in household and national economies. The research was carried out under an FAO André Mayer Research Fellowship, granted to scientists whose research inputs may contribute to FAO's global work towards improved food security. Poultry is viewed within FAO's Special Programme for Food Security (SPFS) as a crucial element in the struggle for sustained food production and poverty alleviation. In rural Africa, the poultry production systems are mainly based on scavenging indigenous chickens, which are found in virtually all villages and households. Over 70 percent of the poultry products and 20 percent of the animal protein intake in most African countries come from this sector. The author, with over 20 years experience in agricultural research and development in rural farming systems of Africa, promotes a holistic multidisciplinary approach to rural poultry production, embracing institutional and organizational capacity building. Gender issues are strongly emphasized. A model for village chicken production systems is presented, and the text is supported by a comprehensive review of the global literature on the subject. The study confirms that enhanced village chicken production forms the basis for transforming the rural poultry sector from subsistence to a more economically productive base. The material is particularly pertinent to countries participating in the SPFS, where village chicken production will have a special impact in increasing household food security and gender equity.

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